JERROLD®

INSTRUCTION MANUAL

CS-PIS-016 435-374

# CHANNEL COMMANDER

## MODEL COM-*

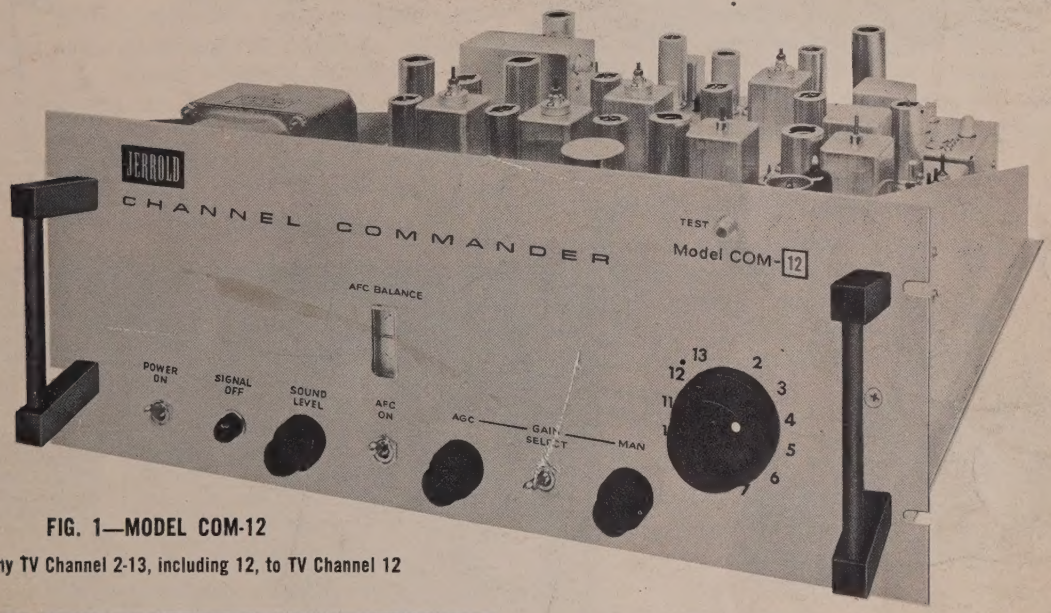


FIG. 1—MODEL COM-12

Converts any TV Channel 2-13, including 12, to TV Channel 12

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*Specify channel conversion desired including on channel (same channel) conversion.

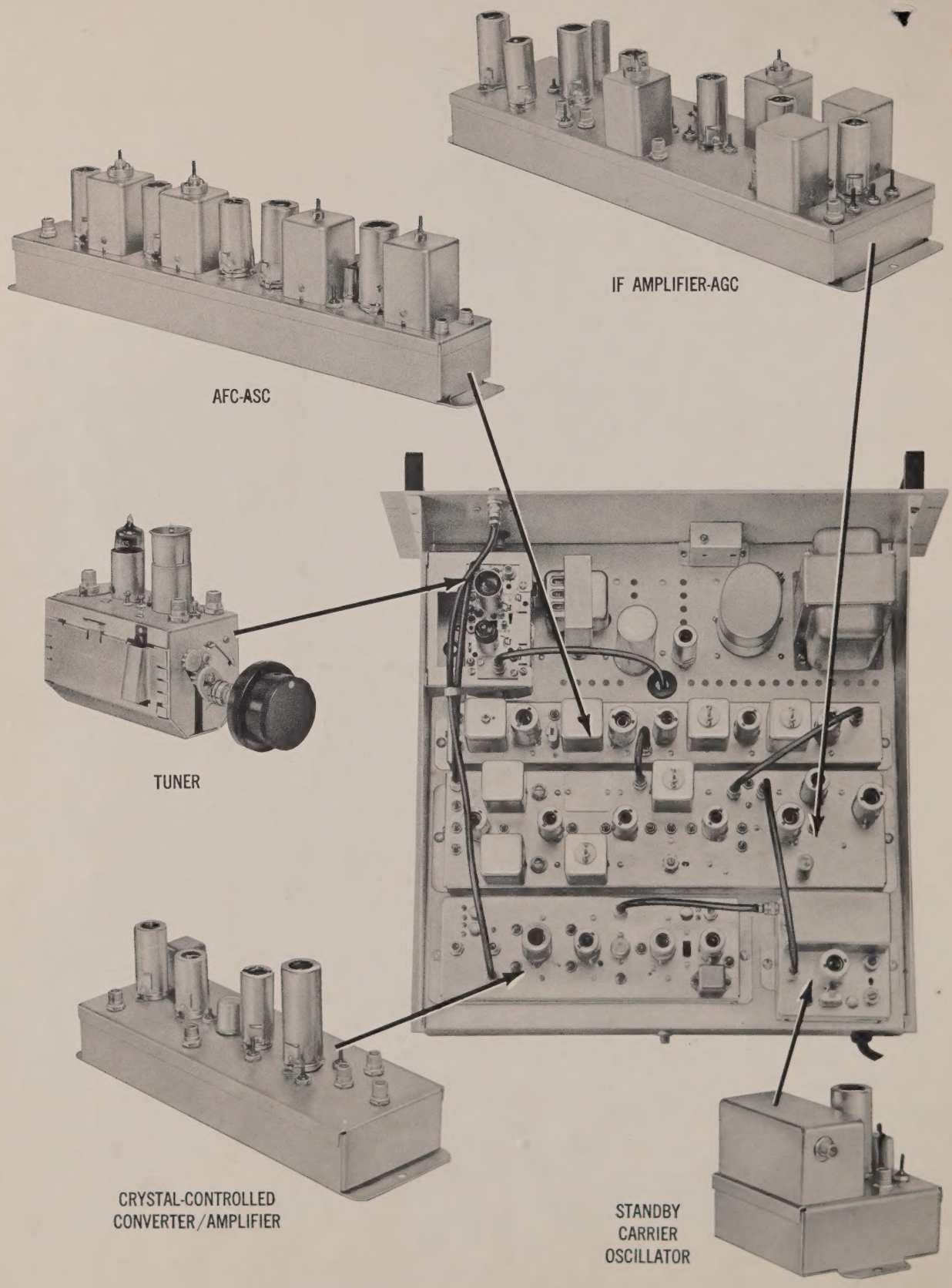



FIG. 2—COMPLETE CHANNEL COMMANDER WITH MODULES EXPLODED

# DESCRIPTION

## GENERAL

The Jerrold Channel Commander Model COM-* is a unitized head-end for completely processing any vhf channel (2-13). The unit controls the signals in such a way that adjacent channels on both high and low bands can be fed to the distribution system thus providing a completely-controlled, compact head-end for up to 12 vhf channels.

Model COM-* is compatible with existing system equipment and may be used to supply an additional vhf channel, to replace obsolete equipment, or as a spare head-end for any vhf channel. The modular construction of the Commander makes it possible to change the output channel by replacing a single module Model CCV-*. Hence, only additional CCV units are required to provide spares for many channels.

The basic Commander unit comprises a main chassis with a built-in Power supply and four modules: Tuner, IF-AGC (intermediate frequency amplifier and automatic gain control), AFC-ASC (automatic frequency and sound control), and a Standby Carrier Oscillator.

Model CCV-*, the Crystal-Controlled Converter/Amplifier, is the plug-in module which provides the particular output channel desired.

## BASIC CHANNEL COMMANDER

### POWER SUPPLY

A sola-regulated supply powers all modules. Additional voltage regulation is provided for the ASC and AGC circuits for better stability.

### TUNER

The tuner will receive any vhf channel according to the position of the channel selector switch. The tuning control circuitry incorporates a balance meter which gives visual indication that the tuner is set to the exact frequency. The automatic frequency control insures that the tuner will remain locked-in precisely on frequency. A special AGC circuit maintains the best possible noise figure on weak antenna signals and prevents overloading on strong (up to 64,000 microvolts) signals. Finally, the tuner amplifies and changes the received signals to relatively low if frequencies.

### IF-AGC

The highly-selective if amplifier incorporates specially-designed traps and filters to eliminate adjacent channel interference. This circuitry assures minimum phase delay for the best reproduction of the incoming color and black and white signals. Sync pulse reference AGC has a noise clipping circuit which provides constant output levels not affected by power line or ignition noises. The fast action of this AGC minimizes airplane flutter.

### AFC-ASC

The automatic frequency control circuitry provides the correction voltage for the tuner. Precise automatic sound control circuitry provides limiting action at relatively low if frequencies to control the on-channel sound carrier. Once set, the desired relationship between sound and video carriers for the channel is precisely maintained.

### STANDBY CARRIER OSCILLATOR

When a station goes off the air a time delay device is automatically energized which triggers a crystal-controlled oscillator to provide a replacement carrier after 20 seconds. A warning light indicates that the station is off-the-air.

## MODEL CCV-*

### CRYSTAL CONTROLLED CONVERTER/AMPLIFIER

The converter in this unit uses a crystal-controlled oscillator to change the if frequencies to any desired TV channel output. In the event that on-channel conversion (i.e., Ch. 2 to 2, 9 to 9, etc.) is desired, the converter oscillator is switched out of the circuit to permit the tuner oscillator to be used for both down and up conversion. Since the same oscillator is now used for both conversions co-channel interference cannot be generated internally. The converted signal is fed via an amplifier to dual outputs each having one volt capability. These dual outputs have an excellent match (VSWR 1.2:1) simplifying mixing with other Commanders or existing equipment.

**CONTENTS OF PACKAGE**

**Carton No. 1**

**1 Unit Channel Commander (main assembly)**
**4 Screws**
**3 Male Connectors Model F-59A**
**1 Warranty Card 435-258**
**1 Instruction Sheet 435-374**

**Carton No. 2**

**1 Unit Model CCV-***
**1 Unit LPF-50 (Channels 4, 5, and 6 only)**
**1 6″ cable (Channels 4, 5, and 6 only)**

# SPECIFICATIONS

## OVERALL

| | |
|---|---|
| Sensitivity | 100 uv (—20 dbj)* input for 57 dbj output |
| AGC Sensitivity | Maximum ±½ db output change for input change of 200 uv (—14 dbj) to 64,000 uv (+36 dbj) |

*0 dbj = 1000 microvolts across 75 ohms.

## TUNER

| | |
|---|---|
| Frequency Range | INPUT: VHF Channels 2 to 13 (one spare position)<br>OUTPUT: 41 mc to 47 mc |
| Noise Figure | 6 db Max. |
| Impedance | 75-ohm input — 75-ohm output, at VSWR 1.1:1 |
| Gain | 17 db minimum |
| Maximum Input | +36 dbj |
| Image Rejection | 50 db minimum |
| AFC | Pull-in Range of ±250 kc minimum |

## VIDEO IF AMP & AGC

| | |
|---|---|
| Bandwidth | 41.6 mc to 46.5 mc |
| IF Response Flatness | Within ¼ db |
| Video Carrier | 45.75 mc |
| Sound Carrier | 41.25 mc |
| Adjacent Carrier Rejection | 50 db minimum |
| Gain Control | Manual or automatic |
| Impedance | 75-ohm input (VSWR 1.2:1); 75-ohm ouput (VSWR 1.2:1) |
| Gain | 46 db minimum |
| Operational IF Output | Video IF Carrier 40 dbj; Sound IF Carrier 25 dbj |
| AGC | Sync Tip Referenced, noise immune |

## SOUND IF & AFC

| | |
|---|---|
| Sound IF frequency | 41.25 mc |
| Sound IF Limiting | 10 db limiting min. @ 25 dbj output with 100 uv input to tuner |
| Sound IF Output | 75 ohms at VSWR 1.1:1 |
| AFC IF | 4.473 mc |
| AFC Audio | 25 mv rms across 100 k ohms, 2% harmonic distortion |

## SIGNAL REPLACER

| | |
|---|---|
| Delay (Off) | 20 sec. approximate |
| Delay (On) | 2 sec. approximate |
| Range | Adjusted to operate at station off-air condition |
| Input | Output of IF amplifier |
| Output | 45.75 mc carrier adjustable and Xtal-controlled |
| Impedance | 75-ohm input VSWR =1.12:1; 75-ohm output VSWR = 1.12:1 |
| Insertion Loss | ½ db maximum |

## CONVERTER/AMPLIFIER

| | |
|---|---|
| Frequency range | input: 41 mc to 47 mc; output; any single VHF Channel 2 to 13 |
| Input Impedance | 75 ohms, VSWR 1.2:1 |
| Output Impedance | Dual 75 ohms, VSWR 1.2:1 |
| Gain | 17 db minimum (with PIP value necessary) |
| Minimum Input | 40 dbj |
| Maximum Output | 57 dbj |
| Oscillator | (1) self-contained crystal controlled;<br>(2) tuner oscillator controlled for on-channel operation |
| Gain Control | Model PIP facility |

## POWER SUPPLY

| | |
|---|---|
| Type | Self-contained with line voltage regulating transformer |
| Power Requirements | 90 v to 130 v, 60 cps, 110 watts |

## MECHANICAL

| | |
|---|---|
| Weight | 30 lbs. |
| Mounting | Standard rack mounting. Panel 7" x 19" x 18" depth, 20" overall, side rails optional |
| Finish | Light grey panel, black artwork. Cadium finish units. |

## TUBE COMPLEMENT

TUNER:

| | | |
|---|---|---|
| 6CG8 | V-2 | Oscillator-Mixer |
| 6GK5 | V-1 | RF Amplifier |

VIDEO IF and AGC:

| | | |
|---|---|---|
| 6CB6 | V-301 | 1st IF Amplifier |
| 6CB6 | V-302 | 2nd IF Amplifier |
| 6CB6 | V-303 | 3rd IF Amplifier |
| 6DC6 | V-304 | 4th IF Amplifier |
| 6AM8 | V-305A | AGC IF Amplifier |
| | V-305B | AGC Detector |
| 6AU6 | V-306 | DC Amplifier |
| 12AT7 | V-307A | Cathode Follower |
| | V-307B | DC Amplifier |

SOUND IF and AFC:

| | | |
|---|---|---|
| 6AU6 | V-203 | 1st IF Amplifier |
| 6CB6 | V-204 | 2nd IF Amplifier |
| 6CB6 | V-205 | Limiter |
| 6BR8 | V-201A | Crystal Oscillator |
| | V-201B | 4.473 mc limiter |
| 6BR8 | V-202A | Mixer |
| | V-202B | Buffer Amplifier |

SIGNAL REPLACER:

| | | |
|---|---|---|
| 6DJ8 | V-401A | Crystal Oscillator |
| | V-401B | Relay Control |

CONVERTER:

| | | |
|---|---|---|
| 5654 | V-501 | Crystal Oscillator |
| 5654 | V-502 | Buffer-Doubler |
| 6CY5 | V-503 | Mixer |
| 12BY7 | V-504 | Output Amplifier |

POWER SUPPLY:

| | | |
|---|---|---|
| 0A2 | V-101 | Voltage Regulator |

# INSTALLATION

1. **Install and Connect Converter Model CCV-***

a. Models CCV-4, 5, and 6 only

(1) Mount low pass filter Model LPF-50 on top of Commander chassis in area bounded by the power transformer, the capacitor, the VR tube, and the AFC-ASC strip. Fasten to chassis thru ¼" holes with snap plugs.

(2) Disconnect cable at IF OUT fitting J204 on AFC-ASC module and connect to right-hand coaxial cable fitting on LPF-50. Interconnect IF OUT fitting J204 on AFC-ASC module and left-hand coaxial cable fitting on LPF-50 via the 6" jumper cable supplied.

b. **Off** channel conversion (i.e., 2 to 3, etc.) CCV-2 thru 13

(1) Plug converter into position at right-rear section of Commander chassis. Turn fasteners ¼ turn clockwise.

(2) Connect **orange** cable (from IF OUT fitting J402 on signal replacer module) to IF IN fitting J502 on converter.

(3) Remove plug from RF TP fitting J506 on converter and connect **blue** cable (from TEST fitting on front panel) to it.

(4) Connect **brown** cables (from dual RF OUTPUT fittings on rear bracket of Commander) respectively to RF OUT 1 fitting J504 and RF OUT 2 fitting J505 on converter.

(5) Disconnect **grey** cable from OSC OUT fitting on tuner module and cap OSC OUT fitting with plug removed from RF TP fitting J506 on converter.

(6) Place EXT-INT switch S501 on converter in **INT** position.

c. **On** channel conversion (i.e., 2 to 2 etc.) CCV-2 thru 13.

(1) Complete 1a (if necessary) and steps b (1) thru b (4) of foregoing procedure.

(2) Connect **grey** cable (from OSC OUT fitting on tuner module) to OSC IN fitting J501 on converter.

(3) Place EXT-INT switch S-501 on converter in **EXT** position.

2. **Mount Commander(s)**

Mount Commander(s) in standard rack in the most convenient manner for mixing the output(s) of the unit(s).

3. **Connect antenna to Commander input**

The Commander may be used with any commercially available antenna.

a. Determine signal strength in microvolts or dbj at antenna input terminal. We recommend a Jerrold Field Strength Meter Model 704B as the ideal instrument for this purpose.

(1) Signal strength less than 100 microvolt (—20 dbj). We recommend installing a mast-mounted preamplifier Jerrold Model 501-AP for the particular channel between the antenna output and the Commander input.

(2) Signal strength on channel 6 **only** more than 1,000 microvolts (0 dbj).

We recommend installing an in-line attenuation pad Jerrold Model PDL to reduce the signal to 0 dbj or less.

b. 75-ohm antenna connection

(1) Connect a length of 75-ohm cable to the antenna output and run cable to ANTENNA INPUT fitting on Commander. Prepare cable end and attach proper connector to cable. Connect connector to ANTENNA INPUT fitting. Hand-tighten firmly and then wrench-tighten no more than 1/6 turn.

Note: Any 75-ohm cable may be used. Please refer to Instruction Book 435-345 Coaxial Cable Fittings, Tools and Accessories for Community Antenna Systems for information concerning other Jerrold cables and the proper fittings.

c. 300-ohm antenna connection

We recommend the use of a 300-75 ohm mast-mounted matching transformer Jerrold Model TO-374 between the antenna output terminals and the ANTENNA INPUT fitting on the Commander.

4. **Make output connections**

a. Mixing Commander output with compatible equipment outputs.

(1) Interconnect Commander RF OUTPUT fittings as though they were the output fittings of a strip amplifier such as Model DPM.

b. Mixing several Commander outputs

The dual output configuration of the Commander permits direct mixing of non-adjacent channels with convenient lengths of 75-ohm coaxial cable.

Note: It is recommended that double-shielded cable be used for these jumpers to prevent undesirable radiation.

In mixing a group of non-adjacent channels, the trunk line output is connected to the **highest** numbered channel and the unused output of the **lowest** numbered channel is terminated with a terminating resistor Jerrold Model TR-75F.

Adjacent channels may be mixed by combining the outputs of two adjacent channels or the outputs of two groups of non-adjacent channels by means of a hybrid mixer such as Jerrold Model 1592.

In mixing two groups of channels (i.e., 2, 4, 6, 8, 10, 12 and 3, 5, 7, 9, 11) interconnect the outputs of the even numbered channels and terminate the unused output of channel 2 in 75 ohms. Connect the unused output of channel 12 to terminal B on Model 1592. Interconnect the outputs of the odd numbered channels and terminate the unused output of channel 3 in 75 ohms. Connect the unused output of channel 11 to terminal C on Model 1592. Connect the trunk line to terminal A of Model 1592.

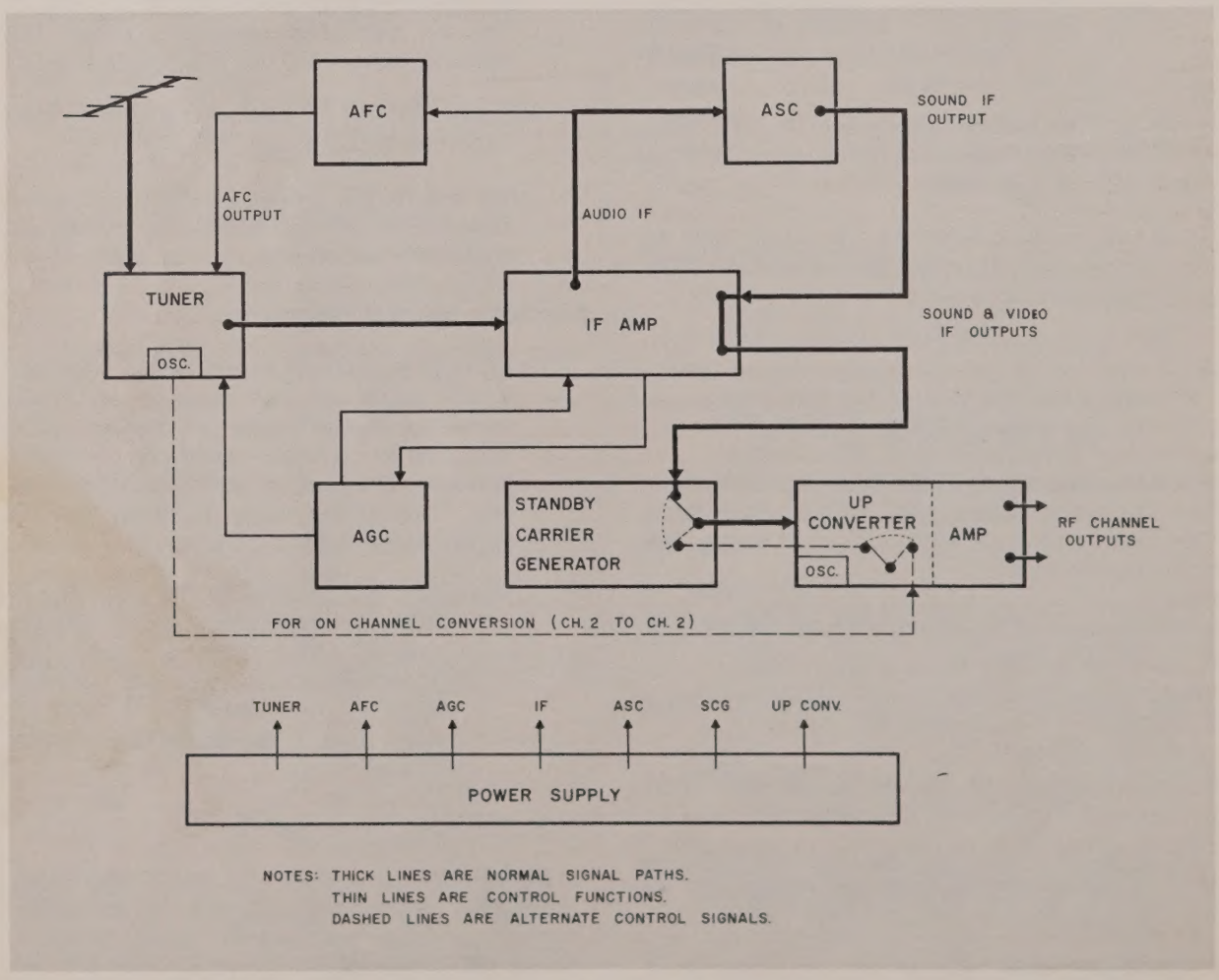



**Fig. 3—Block Diagram of Complete Channel Commander**

# TECHNICAL DESCRIPTION

Refer to block diagram (Fig. 3) and to various schematic diagrams for clarification.

## POWER SUPPLY

The power supply unit converts the incoming ac to +150 volts dc, —150 volts dc and 6.3 volts ac, A line regulating power transformer maintains the secondary supply voltages within specified limits for ac line voltage fluctuations.

Except for the tuner, all units are powered and connected to operating controls via chassis-mounted sockets. The tuner is powered with a 6-conductor jacketed cable.

The ANTENNA INPUT terminal and the RF OUTPUT terminals are located on the rear of the unit.

## TUNER

A Standard-Kollsman tuner comprising a 13-position selector switch with a fine-tuning vernier dial, an rf amplifier stage VI (6GK5), and an oscillator-mixer stage V2 (6CG8) has been modified to Jerrold specifications and with Jerrold parts to become a plug-in module on the Commander.

The IF IN and IF OUT terminals have been modified to incorporate 75-ohm F-61A chassis fittings with back-match accomplished via R8, L8, and C21. An additional OSC OUT F-61A terminal has been provided to permit on-channel operation of the Commander.

To provide the best oscillator stability, the tuner incorporates circuitry for automatic frequency control (AFC). The circuit accepts correcting voltage supplied by the SOUND IF and AFC unit. A varicap (CR1), connected between oscillator plate and grid, varies in capacitance value according to the impressed voltage. Hence, as the oscillator frequency tends to shift, a change in varicap impressed voltage effects a capacity change which returns the oscillator frequency to its original value.

For on-channel operation of the Commander, the tuner oscillator is used as the Model CCV oscillator to maintain station frequency assignments and prevent system beat interference.

The tuner will accept any vhf TV channel at its input terminal and convert the particular channel to a pre-selected intermediate frequency band of 41 to 47 mc.

## IF AMP AND AGC

The if amplifier accepts the if band supplied by the tuner with a picture carrier of 45.75 mc, a sound carrier of 41.25 mc and a color sub-carrier of 42.17 mc. The if amplifier rejects frequencies outside the band of interest with particular emphasis on the adjacent picture carrier of 39.75 mc, the adjacent sound carrier of 47.25 mc, and adjacent color sub-carrier of 48.17 mc.

The IF IN is matched to 75 ohms across the frequency band of 41 mc to 47 mc. This is achieved by loading the grid of V301 (6CB6) with R301 and transforming the resultant grid load to 75 ohms with the double-tuned, optimum-coupled, pass-band circuitry consisting of C301, L301, L302 and L303.

The V301 (6CB6)—V302 (6CB6) interstage is an undercoupled double-tuned pass band configuration with primary tuning (T301), bandwidth control (L307), and secondary tuning (T302). T301 incorporates a mutually coupled adjacent picture carrier (39.75 mc) trap. T302 incorporates a mutually coupled adjacent color sub-carrier (48.17 mc) trap.

The V302 (6CB6)—V303 (6CB6) interstage is an optimum coupled double-tuned pass band configuration with primary tuning L308 and secondary tuning L311. C312 and T303 form the top-end coupling circuit for the interstage. T303 in itself forms a highly efficient adjacent sound carrier (47.25 mc) trap.

The V303 (6CB6)—V304 (6DC6) interstage is an optimum-coupled triple-tuned pass band configuration with primary tuning L312, mid-tuning L315 and secondary tuning L316. C345 and T304 form the top-end coupling circuit for the primary section while C322 forms the top-end capacity-coupled circuit for the secondary section. T304 performs two functions: (1) it provides the accompanying sound "take-off" facility J302 for the SOUND IF and AFC unit, and (2) it provides the accompanying sound trap to reject the accompanying sound from appearing at the out-put terminal of the IF AMP unit. R316 adjusts the sound trap to maximum attentuation.

The plate of the V304 (6DC6) is double-tuned flat across the if band and is transformed with L318, L317 and C327 into two 75-ohm loads. The output is backmatched to 75 ohms with the compensator network consisting of L320, C328 and C329. One IF OUT terminal is used to combine the processed sound if carrier from the SOUND IF and AFC unit with the picture if carrier. The second IF OUT terminal supplies processed picture if and sound if carriers to Model SR-45.75.

The plate of V304 (6DC6) is lightly coupled to the AGC amplifier grid of V305A (6AM8) via C326. The

plate of V305A is peaked to the picture if carrier (45.75 mc) with L323. The signal is fed to V305B (6AM8), a series-connected linear detector. The negative-going output is then fed to V306 (6AU6), a combination dc amplifier and limiter. The positive-going signal is applied to two silicon diodes arranged in a shunt-series configuration. This yields excellent noise limiting and clipping at sync tip level. The shunt diode is referenced to ground while the series diode is referenced to a selected negative voltage (R330 and R329).

The voltage is then applied to the second dc amplifier V307A (12AT7), a cathode follower which employs a fast time constant (R332 and C338). The positive-going signal is applied to the final dc amplifier V307B (12AT7) which develops the negative-going AGC voltage across a relatively low load of 40 k ohms (R33 and R334).

The bias voltage is applied to two separate control points; the if amplifier control grids (V301, V302 and V303) and the tuner rf amplifier (VI) control grid. However, the AGC voltage as developed across R333 and R334 is not directly applied to V1.

For any antenna signal other than that which would require maximum gain, the AGC amp will develop negative bias. The bias will then reduce the gain of V1 and increase the noise figure of the tuner, which is not desirable at low rf antenna signal levels. In the power supply unit, R111 and R115 develop a "bucking" voltage which controls the point at which the developed control bias will be applied to V1 control grid. At low rf antenna signal levels, R110 and R109 establish the required minimum grid bias for V1. A clamp, CR104, is used to prevent positive voltage excursions. At high rf antenna signal levels, control bias is applied to V1 at twice the rate of the if bias in order to overcome the problem of overload due to strong rf antenna signals. The dynamic range of the tuner is thus extended considerably without sacrificing the characteristics of the tuner under weak signal level conditions.

For automatic gain control, the picture carrier output level is established by referencing the cathode of V305A (6AM8) to ground via potentiometer R119, the AGC threshold control. For manual gain control, the GAIN SELECT switch (S102) applies control bias to R333 and R334 via potentiometer R112, the manual gain control. The manual control bias "over-rides" the developed AGC bias by shunting the load of V307B with potentiometer R112. The cathode of V307B (12AT7) is referenced to negative bias via R337, R338 and R339. Potentiometer R338 is used to position sync tips at or near clipping level. Test point TP-301 is used to monitor grid control bias. Test point TP-302 is used to monitor clipping level.

## SOUND IF AND AFC

The SOUND IF and AFC unit accepts the sound if carrier supplied by T304 of the IF AMP unit. The signal is applied to the grid of V203 (6AU6) the 1st sound if amplifier and the grid of V202B (6BR8) the AFC buffer amp.

The V203 (6AU6)—V204 (6CB6) interstage is single-tuned to 41.25 mc with T203. The 41.25 mc signal is fed to the 2nd sound if amplifier, V204 (6CB6), whose plate is single-tuned to 41.25 mc. with T204. The signal is then fed to the grid of the sound limiter V205 (6CB6). The plate of V205 (6CB6) is back-matched with R220 to provide the proper source impedance. The output of the limiter is normally set to an output level of 25 dbj with potentiometer R108, which is located in the power supply unit.

The plate of the AFC buffer amplifier V202B (6BR8) is peaked to 41.25 mc with C221. The signal is then applied to the AFC mixer grid of V202A (6BR8). V201A (6BR8), a crystal-controlled oscillator, generates the 36.777 mc carrier which is also applied to the AFC mixer grid. The plate of V202A is tuned to the difference product of 4.473 mc with T202, a double-tuned mutually-coupled transformer. The 4.473 mc signal is then fed to the grid of the AFC IF limiter V201B (6BR8). The plate of the limiter is tuned to 4.473 mc with discriminator transformer T201, the output of which is applied to the discriminator diodes CR201 and CR202. The resultant audio-output is applied to two terminals: AUDIO OUTPUT (J201) and AFC OUTPUT (J202).

The AUDIO OUTPUT terminal is used for general monitoring purposes. At this point, let us consider the use of the 4.473 mc AFC intermediate frequency instead of the 4.5 mc standard if. At the IF IN terminal there is present a very low level 45.75 mc carrier which will produce, at the output of the mixer (V202), a low level 4.5 mc carrier. This will, in turn, generate an interference beat with the desired 4.5 mc carrier which is produced as a result of 41.25 mc conversion. By off-setting the AFC if carrier from 4.5 mc to 4.473 mc, a 27 kc beat is generated which is outside the audible range. The resultant dc component of the undesired 4.5 mc carrier is negligible.

The AFC OUTPUT is applied to a filter located in the power supply unit to remove the audio components from the AFC correcting voltage. M101, a zero-center meter, is used to set and monitor the

AFC voltage. The AFC correcting voltage is then applied to the tuner varicap circuit. S103 is used to short the AFC correcting voltage for precise setting of the tuner oscillator by observing the AFC BALANCE meter. With the switch open (AFC ON), the correcting voltage is applied to the tuner.

## SIGNAL REPLACER

It is the function of the Signal Replacer (Model SR-45.75) to replace the picture if carrier with a substitute picture if carrier for station-off situations or for pre-determined signal fades.

V401B (6DJ8), the relay control tube, samples the grid bias voltage via R407. It is adjusted to conduct at a pre-selected grid bias (or antenna signal levels) with the SENSITIVITY control R409. In the OFF position, V401B does not conduct and RY401 is in the normal open position. The if signal from the IF AMP and AGC unit is connected to J401. The signal is delivered via a 75-ohm artificial line to J402, the IF OUT terminal. B+ is applied via R 406 to C405 to maintain a charge on C405. The delay circuit between V401B plate and grid consists of R405, R404 and C405.

At the station-off condition, or for a pre-determined signal fade, the grid bias approaches zero and V401B conducts. Due to the Miller effect time delay circuit, the relay will be energized after approximately 20 seconds. The IF IN terminal will be disconnected from the IF OUT terminal. B+ will be applied to V401A (6DJ8), a 45.75 mc crystal-controlled oscillator. The oscillator output is coupled to the IF OUT terminal thru C403, the carrier level adjusted with potentiometer R403. B+ will also be applied to DS101, a SIGNAL OFF warning light. The plate-to-grid delay circuit is also disconnected so that with the return of grid bias, RY401 returns to the OFF position within two seconds.

With no B+ applied to V401A, the plate circuit consisting of L401 and C403 detunes to appear outside the IF band of interest.

## CONVERTER

It is the function of the converter, Model CCV-*, to convert the incoming if band to a pre-selected vhf band.

The converter accepts the processed picture if carrier and sound if carrier from the Signal Replacer or the IF AMP and AGC unit. The if input is matched to 75 ohms across the band. This is achieved by loading the grid of V503 (6CY5), the mixer stage, with R507 and transforming the resultant grid load to 75 ohms with L505 and C511. The input configuration utilizes a plug-in pad facility at J503 for coarse-level adjustment of the if signal to the mixer. The mixed injection voltage developed across R508 can be monitored at C512, a feed-thru bypass capacitor.

The oscillator signal is also fed to the mixer grid of V503. The crystal-controlled oscillator signal is generated in V501 (5654) and fed via C503 and S501 to the grid of the buffer amplifier V502 (5654). The plate of V502 is tuned to the required converter frequency with L504 and applied to the mixer grid of V503 via C510. With the OSCILLATOR selector switch S501 in the INT position, the oscillator signal is generated in V501. On CCV-2 thru CCV-6, the oscillator operates at the fundamental frequency and V502 is tuned to the fundamental frequency. On CCV-7 thru CCV-13, the oscillator operates at a pre-selected frequency and V502 is tuned to the second harmonic of the oscillator frequency.

For on-channel operation of the Channel Commander (i.e., outgoing vhf channel same as incoming vhf channel), place the OSCILLATOR selector switch in the EXT position. This will disconnect B+ from the oscillator stage V501 and connect the OSC in terminal (J501) to the grid of the buffer amplifier (V502). The oscillator signal will be obtained from the OSC OUT terminal of the tuner. This technique retains the station frequency assignment in the outgoing vhf channel in order to prevent beat interference between a station vhf channel and an off-set vhf channel.

The plate of V503 (6CY5) is coupled to the grid of the output stage V504 (12BY7A) with a double-tuned over-coupled pass band configuration. This is achieved with L506 (primary tuning), C515 (bandwidth control) and L507 (secondary tuning). The low impedance grid of V504 is decoupled from the interstage secondary with C516. This also minimizes response curve shifts with V504 tube replacements. V504 also utilizes screen inductance L509 to raise the resultant input impedance of the grid circuit of V504.

The plate of V504 is single-tuned and serves as the "fill" for the V503-V504 interstage. It is designed to work into two 75 ohm loads with L510 (center-frequency tuning) and L511 (loading adjustment). The plate circuit is back-matched to insure mixing of semi-adjacent converters. The back-match is obtained with L518, L519, C531, C522, C521, C532 and L512. The output terminals are J504 and J503.

A —40 db vhf test point is incorporated in the Model CCV.

# CONTROLS AND FITTINGS

| NAME | SCHEM. DES. | TYPE | FUNCTION |
|---|---|---|---|
| | | **FRONT PANEL** | |
| POWER ON | S101 | 2-pos. switch<br>up<br>down | <br>Energizes power supply from 117-v ac source<br>De-energizes power supply |
| GAIN SELECT | S102 | 2-pos. switch<br>left<br>right | <br>Gain of if amplifier automatically controlled<br>Gain of if amplifier manually controlled |
| AFC ON | S103 | 2-pos. switch<br>up<br>down | <br>Frequency controlled automatically<br>Shorts AFC to permit fine tuning of tuner |
| 2 thru 13<br>(Tuner knob of control on right of panel) | NONE | 13-pos. switch<br>2 thru 13 | <br>Position of white dot indicates vhf channel selection |
| (Outer vernier dial of control on right of panel) | NONE | Inductance Tuning Device (360°) | Fine tuning of individual vhf Channel selected with AFC switch in down position |
| SIGNAL OFF | DS101 | Neon bulb | Glows to indicate that station is off the air |
| SOUND LEVEL | R108 | Potentiometer | Sets sound rf carrier level |
| AGC | R119 | Potentiometer | Sets video rf carrier level with GAIN SELECT switch in left position |
| MAN | R112 | Potentiometer | Sets video rf carrier level with GAIN SELECT switch in right position |
| AFC BALANCE | M101 | Meter | Indicates automatic frequency control voltage. Tune fine tuning vernier for null or zero reading. |
| TEST | NONE | Coaxial cable fitting | —40 db ±2 db test point for VHF output of Commander |
| | | **REAR BRACKET** | |
| RF OUT (2) | NONE | Coaxial cable fittings | 75-ohm dual rf output |
| ANTENNA IN | NONE | Coaxial cable fitting | 75-ohm antenna rf input |
| | | **TUNER** | |
| ANT IN | ANT IN | Coaxial cable fitting | 75-ohm antenna input |
| IF OUT | IF OUT | Coaxial cable fitting | 75-ohm if output |
| OSC OUT | OSC OUT | Coaxial cable fitting | 75-ohm oscillator output |
| | | **VIDEO IF AND AGC** | |
| IF IN | J301 | Coaxial cable fitting | 75-ohm if input |
| SOUND OUTPUT | J302 | Coaxial cable fitting | 75-ohm sound output |
| IF OUT | J303, 304 | Coaxial cable fittings | 75-ohm dual if output |
| SOUND ADJ. | R316 | Potentiometer | Factory-adjusted |
| CLIPPING LEVEL | R338 | Potentiometer | Factory-adjusted |
| | | **SOUND AND AFC STRIP** | |
| AUDIO OUTPUT | J201 | Coaxial cable fitting | 75-ohm audio output |
| AFC OUTPUT | J202 | Coaxial cable fitting | 75-ohm AFC output |
| IF IN | J203 | Coaxial cable fitting | 75-ohm if input |
| IF OUTPUT | J204 | Coaxial cable fitting | 75-ohm if output |
| | | **SIGNAL REPLACER** | |
| IF IN | J401 | Coaxial cable fitting | 75-ohm if input |
| IF OUT | J402 | Coaxial cable fitting | 75-ohm if output |
| OSC LEVEL | R403 | Potentiometer | Sets CARRIER LEVEL from oscillator of signal replacer |
| SENSITIVITY | R409 | Potentiometer | Adjusts SIGNAL OFF of signal replacer for pre-determined signal fade |
| | | **CONVERTER** | |
| OSC IN | J501 | Coaxial cable fitting | 75-ohm oscillator input |
| IF IN | J502 | Coaxial cable fitting | 75-ohm if input |
| PIP | J503 | Four-prong receptacle | Receptacle for PIP pad |
| RF OUT 1 | J504 | Coaxial cable fitting | 75-ohm rf output |
| RF OUT 2 | J505 | Coaxial cable fitting | 75-ohm rf output |
| RF TP | J506 | Coaxial cable fitting | 75-ohm rf test output |
| EXT-INT | S501 | 2-pos. switch<br>EXT<br><br>INT | <br>Permits on channel (i.e., channel 2 to channel 2, etc.) conversion<br>Permits normal (i.e., 2 to 3, etc.) conversion |

# OPERATIONAL PROCEDURE

**(Step-by-step for each Commander)**

1. Plug Commander into 117-v ac power source.
2. PLACE POWER ON switch in POWER ON position and allow at least 30 minutes warm-up time.
3. Place GAIN SELECT switch in AGC position.
4. Place AFC ON switch in down position (off).
5. Turn inner knob of selector switch until white dot is on desired channel.
6. Slowly rotate outer vernier of selector switch to obtain a null or zero indication on AFC BALANCE meter.

   Note: In the presence of a strong adjacent video carrier it is possible for the tuner oscillator to convert the undesired video carrier to 41.25 mc. To insure that the tuning adjustment is correct, connect a TV receiver to TEST fitting on Commander. If a good, clear picture is obtained, the adjustment is proper. If a faded or distorted picture is obtained, re-tune tuner for another null and a good, clear picture.

7. Place AFC ON switch in AFC ON position.
8. Check signal strength of video and audio rf carriers for the desired channel at the trunk line input with a Jerrold FSM 704-B.

   Note: Each Commander has been factory-adjusted with plug-in pads (PIP-3, 6, etc.) to provide a video carrier signal level of 57 dbj $\pm$ 1 dbj and a sound carrier signal level of 42 dbj $\pm$ 1 dbj at each RF OUTPUT of the Commander. Assuming a 3 db loss in a Model 1592 hybrid mixer, the readings at the trunk line input (mixer-output) should be respectively 54 dbj $\pm$ 1 dbj for the video carrier and 39 dbj $\pm$ 1 dbj for the sound carrier.

9. Determine length and type of cable used in run to first repeater amplifier location. Calculate the loss in db for video carrier of each channel controlled by a Commander which is to be carried on the cable. See Cable Attenuation Data/Channel chart in Jerrold publication SD-3, Reference Data for Community Systems.

   **Example**

   Type of cable—JT-200 Length of run—3000′ 9-channel Commander system Chs. 2, 3, 4, 5, 6, 7, 9, 11, and 13. Loss in db/100′ PIX at 70° F for JT-200 given for each channel in table in SD-3. Multiply figure from table by 30 to calculate loss at 3000′.

   | | | |
   |---|---|---|
   | Ch. 13—41.4 db | Ch. 7—37.5 db | Ch. 4—22.2 db |
   | 11—40.2 db | 6—24.9 db | 3—21.3 db |
   | 9—39.0 db | 5—24.0 db | 2—20.1 db |

10. Consult repeater amplifier specificfiations to determine the input level for each channel required by the particular amplier used. For repeater amplifiers, the normal operating input in dbj will be given for the highest channel covered depending upon the number of channels used in the particular system. The tilt of the amplifier response (either built-in or provided by an equalizing pad) to compensate for varying signal attenuations of different frequencies through a given length and type of cable to the next repeater amplifier will also be given in db. Since we are concerned with the input to the **first** repeater amplifier, the output of the head-end must be tilted in accordance with the tilt specifications of the particular amplifier.

    **Example (flat output of SCA-213 desired)**

    Type of amplifier—SCA-213 with PVE-24 inserted. Normal operating input for 9-channel operation—10 dbj at ch. 13. Tilt provided by PVE-24 —ch. 13 = 0 db, ch. 7 = 2 db, ch. 6 = 9 db, ch. 2 = 12 db. Input levels required for **first** repeater amplifier.

    | | | |
    |---|---|---|
    | Ch. 13—10.0 dbj | Ch. 7—12.0 dbj | Ch. 4—21.0 dbj |
    | 11—10.7 dbj | 6—19.0 dbj | 3—21.5 dbj |
    | 9—11.3 dbj | 5—19.5 dbj | 2—22.0 dbj |

11. Set output levels of each Commander according to data derived from steps 9 and 10.

    a. Determine amount of signal in dbj available for the required cable run. From 54.0 dbj (factory-set video carrier level provided by each Commander at trunk line input. See step 8) subtract the input level in dbj required at the first repeater amplifier for the particular channel as derived in step 10.

       Example: 54.0 dbj—10.0 dbj (input required at ch. 13) = 44.0 dbj signal available for cable run at ch. 13.

b. Determine the amount in db by which the signal at the trunk line input for the particular channel must be attenuated to provide the required input to the first repeater amplifier.

From the signal available for the cable run at the particular channel as derived in 11a subtract the signal loss in the cable for the particular channel derived in step 9.

Example: 44.0 dbj (signal available at ch. 13) —41.4 db (signal loss at ch. 13) = 2.6 db attenuation required at trunk line input of ch. 13.

c. Determine signal levels at trunk line input as measured by FSM 704-B required for each channel by subtracting attenuation required from 54.0 dbj.

Example: 54.0 dbj—2.6 db (req. for ch. 13) = 51.4 dbj at trunk line input as measured by FSM 704-B.

Proper levels for all 9 channels

| | | |
|---|---|---|
| Ch. 13—51.4 dbj | Ch. 7—49.5 dbj | Ch. 4—43.2 dbj |
| 11—50.9 dbj | 6—43.9 dbj | 3—42.8 dbj |
| 9—50.3 dbj | 5—43.5 dbj | 2—42.1 dbj |

d. Adjustment procedure:
Increase (if necessary) the value of the PIP pad factory-installed at the converter input to leave the smallest ± remainder of change. Then re-adjust AGC control to produce desired video carrier level as read at trunk line input by FSM 704-B. Finally, re-adjust SOUND LEVEL control till signal level is 17 db below the video carrier level.

12. Check video carrier signal levels at input to first repeater amplifier. If, due to variations in cable, there are any discrepancies, note the differences and adjust Commander outputs accordingly.

13. Disconnect antenna from input of Commander and wait about 20 seconds. SIGNAL OFF indicator on front panel should light.

14. Adjust OSC LEVEL control on signal replacer module to obtain an output signal level (as read on FSM 704-B at trunk line input) corresponding to the operational video carrier level for the particular channel.

15. Re-connect antenna input and SIGNAL OFF indicator light should go off in about two seconds.

Note: If light does **not** go off, advance SEN control on signal replacer module slowly clockwise until light goes off. Repeat steps 14 and 15.

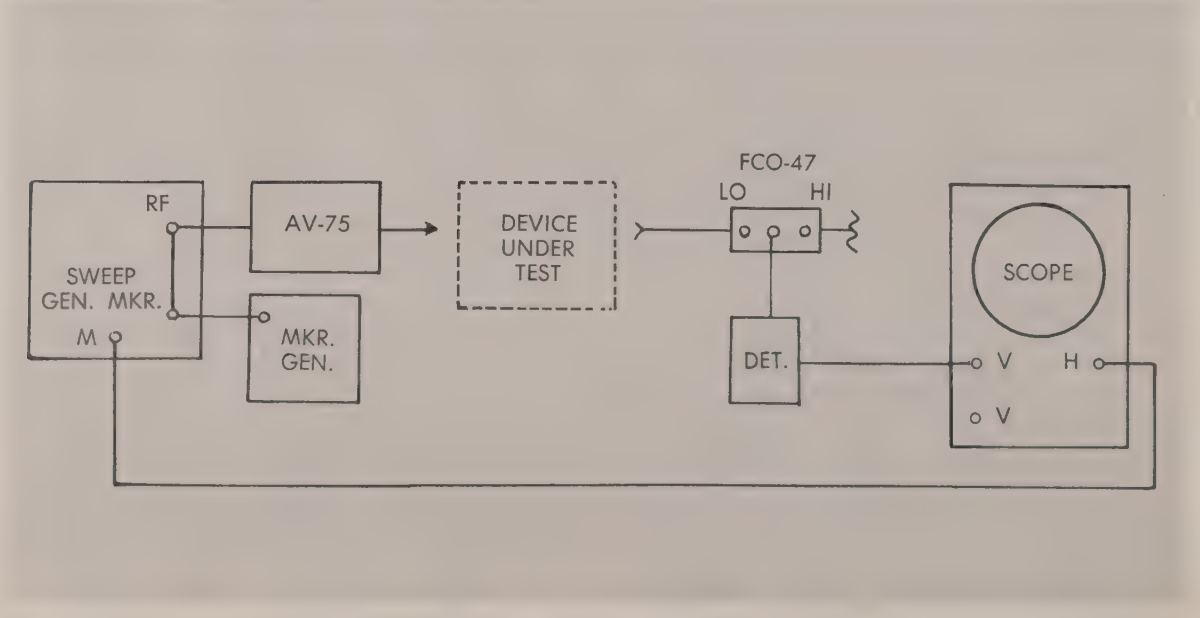



Fig. 4—Test Set-up 1

# MAINTENANCE

## MODULE REPLACEMENT

The Commander has been designed for long, trouble-free service. Its modular construction makes it simple to provide a spare module for the infrequent times when alignment may be necessary for a particular module due to new tube characteristics.

## TUBE REPLACEMENT

Replace tubes with tubes exactly similar to those removed. Check signal level to insure that the proper output is still available from the particular module.

## ALIGNMENT PROCEDURES

In the event that the response of any module is appreciably degraded due to tube changing or for any other reason it is recommended that the module be replaced by a spare module and the faulty module be sent to the factory for re-alignment unless the proper equipment and thoroughly trained technicians are available.

**Equipment required for alignment and test.**

Sweep Generator—Jerrold Model 900A or 601
Oscilloscope—5″ screen, calibrated vertical amp.
Detector—Jerrold Model D86
Attenuators (2)—Jerrold Model AV-75 or A-72
Jig Shield—Jerrold Model AJ-106
Probe—Low capacity, divider type 10 to 1
Meter—VTVM, high input impedance
Pad—Jerrold Model PDL-6
Field Strength Meter—Jerrold Model 704-B
Marker Generator (X-tal)—Jerrold Model CM-6
Marker Generator (variable)—Weston or RCA
Filter—Jerrold Model FCO-47

## TUNER ALIGNMENT

1. Set up equipment (Fig. 4).
2. Turn power switch to POWER ON and allow 5 minutes warm-up.
3. Turn AFC switch OFF, GAIN SELECT switch to MAN.
4. Set sweep generator for desired channel and marker generator to provide marks at video and sound carriers for desired channel.
5. Observe response for flatness and band-pass.
6. Adjust C12 and C13 for a flat response (±½ db) curve with picture and sound carriers on the top of the curve.

## VIDEO IF ALIGNMENT

1. Set up equipment (Fig. 4).
2. Turn POWER ON switch to off position.
3. Place AJ-106 over V304 and a 6-db pad on one of fittings J303 or J304. Terminate unused output with TR-75F.
4. Observe response and adjust L317 and L318 for flat response from 41 to 47 mc.
5. Turn POWER ON switch to POWER ON position and allow 5 minutes warm-up.
6. Place AJ-106 over V303, GAIN SELECT switch to MAN position and manual gain control maximum ccw.
7. Adjust T304 and R316 for maximum attenuation at 41.25 mc.
8. Adjust L312, 315, and 316 for response curve (Fig. 5).

   L312 is adjusted for the 41.6 mc point. L316 places the video carrier (45.75 mc) within ½ db of the top of the curve. L315 adjusts the roll-off next to the 41.6 mc point. Recheck the trap frequency and attenuation with T304 and R316. Readjust the bandpass circuits if necessary. The valley between markers should not exceed ¼ db.

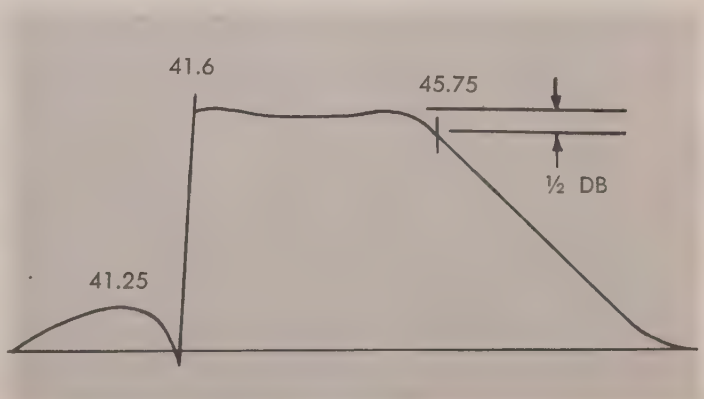



Fig. 5—Response Curve (L312, 315, and 316 adjustment)

9. Connect a VTVM to TP301 and adjust the manual gain control for a reading of minus 3 volts. Install the AJ-106 over V302. Be sure the tube shield is replaced on V303. Adjust T303 for maximum attenuation at 47.25 mc. This trap must be set on frequency before proceeding with this interstage alignment. Now adjust L308 and L311 for the response curve (Fig. 6).

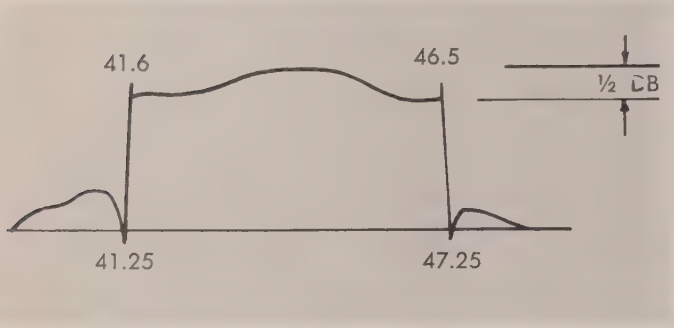



Fig. 6—Response Curve (L308 and 311 adjustment)

L308 adjusts the hump in the center of the curve. L311 adjusts the 46.5 mc point. Recheck the trap frequency and readjust the bandpass circuit if necessary.

10. Install the sweep input on J301. Output should come from J303 with J304 terminated. Adjust C306 for maximum attenuation at 39.75 mc. Adjust C308 for maximum attenuation at 48.17 mc. Adjust T301, T302 and L307, for the response curve (Fig. 7).

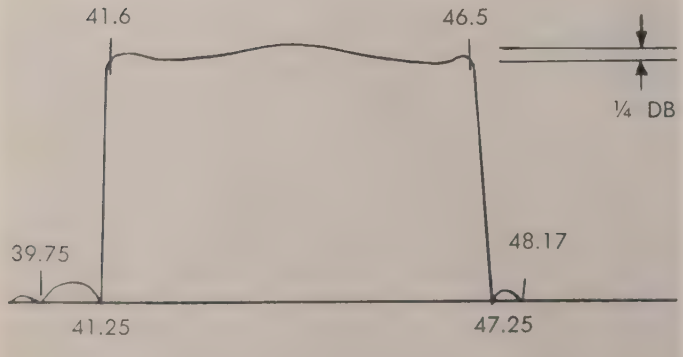



Fig. 7—Response Curve (T301 and 302 and L307 adjustment)

T301 and T302 are bottom adjustments for band edges. L307 is the band width adjustment. These adjustments affect the traps C306 and C308. Continuous monitoring of the trap frequencies is necessary while aligning this interstage. This interstage should be within ½ db between 41.6 and 46.5 mc. It may be necessary to touch-up the other stages to bring the overall flatness within ¼ db. L308—left of center; L311—46.5; L312—41.6; L316—right of center; L315—left of center. Do not adjust the input circuit (L301, L302 and L303) or the output circuit (L317, L318 and L320).

## AFC AND ASC ALIGNMENT

1. Commander in normal operating condition.

2. Disconnect tuner from if amplifier and feed if amplifier with a 41.25 and a 45.75 mc crystal-controlled signal via an AV-75 attenuator.

3. Connect FSM-704B to one RF OUTPUT of Commander.

4. Turn SOUND LEVEL control maximum cw.

5. Tune FSM-704B for maximum indication at sound carrier level for particular channel. Use a low input signal to the video if to stay below limiting level. Adjust T203 and T204 for maximum output. Now turn the SOUND LEVEL control maximum ccw. Adjust T304 and R316 on the video if chassis for maximum attenuation at 41.25 mc.

6. Place a VTVM on the limiter grid test point (C233) and adjust L201 for maximum negative voltage. Back adjustment out ½ turn. This energizes 36.777 mc oscillator circuit.

7. Remove VTVM from limiter grid test point and connect a low capacity probe to feed into a scope via a detector D-86. Remove cable connection from IF INPUT and feed signal (40.5 to 42 mc) from sweep generator via AV-75 attenuator to IF INPUT. Connect marker generator to sweep.

8. Hook the low capacity probe to limiter grid test point (C233). Adjust C221 and T202 top and bottom for response curve (Fig. 8). Keep the sweep input at a level to maintain 2 volts.

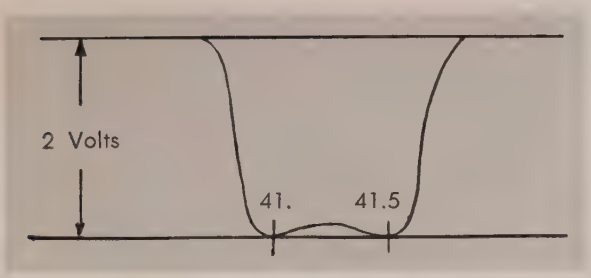



Fig. 8—Response Curve (C221 and T202)

The flat portion between 41 and 41.5 mc should not vary more than .2 volts. The .2 volt tilt or valley corresponds to approximately 1 db variation. T201 primary tuning affects this curve during sweep alignment only because of the fast time constants involved in the limiting action. Remove D-86 detector between scope and probe. Connect probe between AUDIO OUTPUT T201 and scope.

Plug in the shielded wire from the tuner and meter circuit into J202 AFC OUTPUT. Adjust T201 top and bottom for the response curve (Fig. 9).

The bottom adjustment is the center crossover point. The top adjustment controls the amplitude and linearity of the curve. Adjust for maximum amplitude with equal displacement above and below the base line. This completes the alignment of this strip.

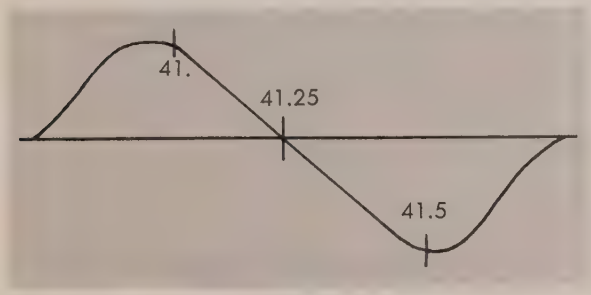



Fig. 9—Response Curve (T201 adjustment)

## CLIPPING LEVEL ALIGNMENT

1. Place Commander in operating condition and tune properly to the vhf channel desired.

2. Connect FSM 704B to one RF OUTPUT of Commander, terminate other RF OUTPUT with TR-75F. Tune FSM-704B to video carrier of the desired vhf channel and set the AGC gain control for 57 dbj output.

3. Connect a scope to TP302. Adjust the CLIPPING LEVEL control till the sync tips just start to compress. Note the FSM reading and back off this control for a reduction of 2 db. Reset the AGC gain control for 57 dbj output. Turn the locking nut tight on the clipping level control. This completes final set-up of the AGC circuits.

## SIGNAL REPLACER ALIGNMENT

1. Place Commander in operating condition and tune properly to the vhf channel desired. Connect FSM-704B to RF OUTPUT and terminate other RF OUTPUT with TR-75F. Tune FSM-704B to video carrier of desired vhf channel. Turn the OSCILLATOR LEVEL control maximum cw. Adjust SENSITIVITY control till SIGNAL OFF indicator lights. Adjust L401 for maximum output as read on FSM-704B. Back this adjustment down 2 db on the slow side of the peak. Adjust video carrier level to 57 dbj with OSCILLATOR LEVEL control.

2. Disconnect antenna from ANTENNA INPUT of Commander. SIGNAL OFF indicator should light after about 20 seconds. If it does not light, turn SENSITIVITY control ccw until it does light.

3. Re-connect antenna to ANTENNA INPUT of Commander. SIGNAL OFF indicator light should go out after about 2 seconds. If it does not go out, turn SENSITIVITY control slightly cw until it goes off. Then repeat process to insure that replacer is working properly.

## CONVERTER MODEL CCV-*

### INPUT MATCH

1. Place Commander in operating condition with POWER ON switch in POWER ON position.

2. Place oscillator INT-EXT switch (S501) in EXT position.

3. Connect external—3.5 volt bias to C512 (mixer injection volts test point). This is a 1000 pf feed-thru capacitor located between V503 and L505.

4. Insert a PIP-O at J503.

5. Using a standard Jerrold Match set-up, connect at IF IN. (J502)

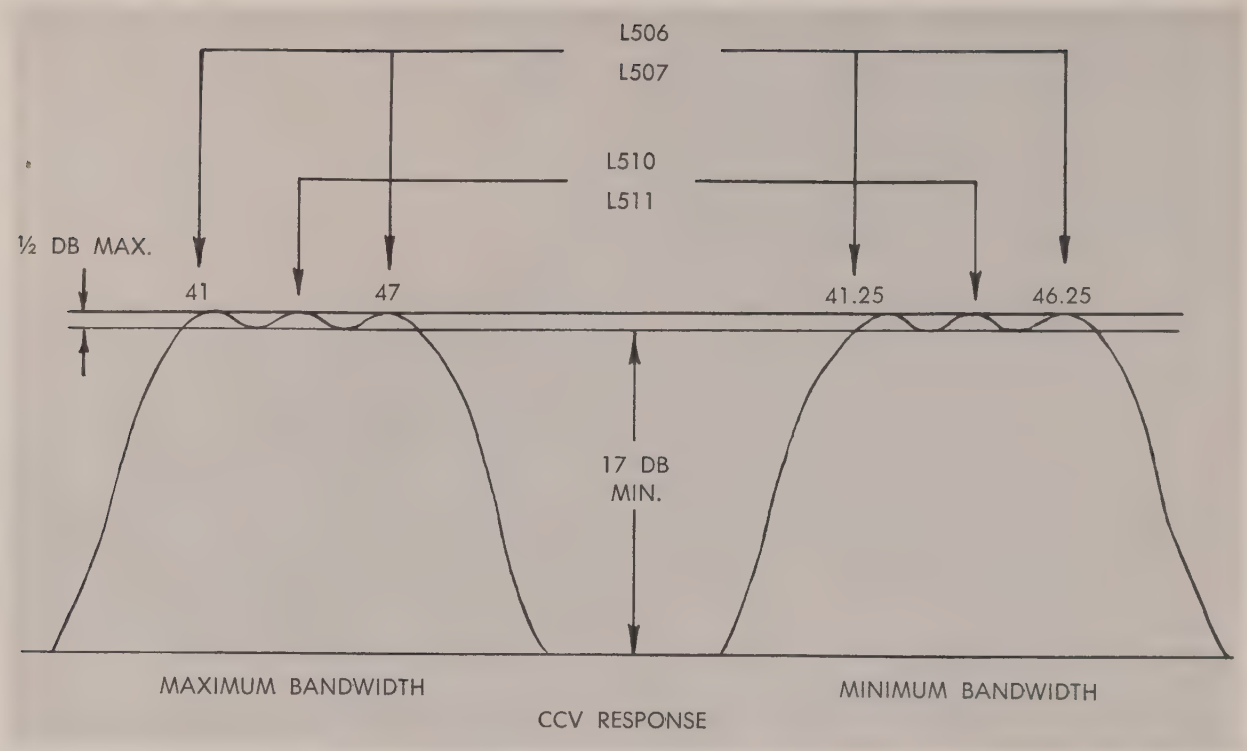



**Fig. 10—CCV Response**

6. Tune the top and bottom slugs of L505 to yield the best input match in the intermediate-frequency band of 41 to 47 mc/s. The circuit shall yield a return loss of 20 db minimum. (Exercise caution in use of sweep generators which might yield erroneous return loss measurements due to presence of second harmonics. This can be established by inserting a low pass filter (FCO-47) in the output line of the sweep generator.)

## OSCILLATOR ADJUSTMENT

**(Off-channel oscillator)**

1. Remove external —3.5 volts bias from C512.
2. Connect VTVM to C512.
3. Terminate IF IN Terminal (J502) with a TR-75F.
4. Place Oscillator INT-EXT switch (S501) in INT position.
5. Adjust L501 for peak, peak L504, adjust C534 (lo-band) or C503 (hi band) for —3.9 volts. Reset L501 for —3.5 volts on the slow side. This will generally yield maximum conversion gain. Gain will deviate 1 db with a bias variation from —2.5 to —5.0 volts.
6. Check for oscillator stability by alternately turning POWER ON switch off and on.

## OSCILLATOR ADJUSTMENT

**(On-Channel)**

1. Tune desired channel properly with selector switch and fine tuning control.
2. Repeat steps 1, 2, and 3 of off-channel adjustment.
3. Connect tuner OSC OUT connector to CCV OSC IN (J501) with 17″ length of RG-59/U.
4. Place CCV Oscillator INT-EXT switch in EXT position.
5. Measure mixer injection volts and adjust C506 (located thru hole adjacent to J501) for —3.5 volts bias.

## RESPONSE

1. Set up equipment as in Fig 4, but without the FCO-47 in the circuit.

2. Terminate RF OUT 1 (J504) and place INT-EXT switch (S501) in INT position.

3. Adjust L506, L507, L510 and L511 to yield a response curve similar to figure 10.
   L506 and L507 are the variable tuning adjustments of an overcoupled, double tuned pass band configuration. L506 is the primary tuning adjustment, L507 is the secondary tuning adjustment, C515 is the top-end capacity coupling while R516 (low band only) is the loading. L510 and L511 are the variable tuning adjustments of a single tuned "fill" for the V503-V504 interstage. L510 is the center frequency adjustment and L511 is the loading control. Greater L511 inductance will yield less bandwidth (sharper "fill") while less L511 inductance will yield more bandwidth (broader "fill"). Check response at J505, if it is tilted, adjust J504 response to yield ½ db flatness.

4. The peak-to-valley ripple shall not exceed ½ db and the minimum gain shall be 17 db and the maximum gain shall be 23 db.

5. On the low channels (particularly 2, 3 and 4), L506 and L507 may have to be detuned slightly to yield the desired response since the coupling capacitor (C515) is a fixed value.

6. On the high channels (particularly 11, 12 and 13) the outer poles can be sharpened by increasing the inductance of L509. Exercise caution, however, since too much L509 will interfere with output match. If the L509 required for proper response and gain prevents proper match, select a new 12BY7A.

7. The overall IF band of interest is 41 to 47 mc. The Commander actually shapes this to the required band of 41.25 mc to 46.25 mc. Therefore, the converter can be aligned to a minimum flat-top of 41.25 mc to 46.25, or to a maximum flat-top of 41 to 47 mc. This band will be established by the tolerances of C515, C516, R516 (low band) and the tube characteristics.

## OUTPUT MATCH

1. Place Oscillator INT-EXT switch (S501) in EXT position. Terminate either J504 or J505 with a selected TR-75F.

2. Using standard match set-up, check for match at unterminated RF OUT terminal. Adjust C521, C522, L512 and L528 to yield match pattern of 15 db return loss within the band and 20 db of return loss outside of band, L512 and L528 shall be similar to each other in order to maintain symmetry match at either RF OUT terminal.

3. Check both RF OUT terminals for symmetry. Adjust if required.

4. Recheck both response (INT-EXT switch in INT position) and match (INT-EXT switch in EXT position).

# REPLACEMENT PARTS LIST

## MAIN ASSEMBLY AND POWER SUPPLY

| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| | **CAPACITORS** | |
| C102 | 150 x 150 — 250 v | 127-600 |
| C103 | 10 mfd 450 wv tubular | 127-024 |
| C104, 105 | 60 mfd 250 wv | 127-007 |
| C106 | .25 mfd 200 wv | 125-008 |
| C107 | .1 mfd 200 wv | 125-020 |
| C108, 109, 110, 111, 112, 113, 115, 117, 119, 120, 121, 122 | .005 mfd cer. disc | 124-029 |
| C114, 116, 118 | .001 mfd cer. disc | 123-115 |
| | **INDICATING LIGHT** | |
| DS101 | Neon bulb | 102-504 |
| | **LINE CORD** | |
| NONE | 3 ft. | 659-102 |
| | **METER** | |
| M101 | Harmon Kardon balance | 171-212 |
| | **RECTIFIERS** | |
| CR101, 102, 103, CR104 | 750 ma —800 piv Silicon 400 piv Solitron CER70 | 137-711 137-712 |
| | **RESISTORS** | |
| R101, 102 | 100 ohm 10 w ww | 113-017 |
| R104 | 2 k ohm 10 w ww | 113-007 |
| R105 | 470 ohm 2 w 10% | 112-322 |
| R106 | 330 ohm 1 w 10% | 112-300 |
| R107 | 12 k ohm 1 w 10% | 112-501 |
| R108 | 50 k ohm pot 2 w | 118-024 |
| R109 | 820 ohm ½ w 5% | 112-350 |
| R110 | 91 k ohm ½ w 5% | 112-608 |
| R111 | 15 megohm ½ w 5% | 112-884 |
| R112 | 10 k ohm pot 2 w | 118-026 |
| R113 | 130 k ohm ½ w 5% | 112-629 |
| R114 | 1 k ohm ½ w 5% | 112-359 |
| R115 | 470 k ohm ½ w 5% | 112-695 |
| R116 | 24 k ohm ½ w 5% | 112-536 |
| R117 | 270 k ohm ½ w 5% | 112-665 |
| R119 | 5 k ohm pot 2 w | 118-023 |
| R121 | 1 megohm ½ w 5% | 112-737 |
| R122 | 82 k ohm ½ w 5% | 112-602 |
| R123 | 10 ohm ½ w 5% | 112-107 |
| | **SWITCHES** | |
| S101, 102, 103 | spst switch | 162-001 |
| | **TRANSFORMER (w/capacitor)** | |
| T101 | Transformer | 141-109 |
| | **TUBE** | |
| V101 | 0A2 | 132-100 |

## TUNER*

| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| | **CAPACITORS** | |
| C11, 22 | 6.8 pf TCZ | 121-009 |
| C21 | 36 pf TCZ | 121-021 |
| C23 | .33 pf ceramic | 122-027 |
| | **JACKS** | |
| ANT IN, OSC OUT, IF OUT | F-61A w/hdwr | C821-155 |
| | **SEMI-CONDUCTOR VARICAP** | |
| CR1 | Pacific Model V7 | 128-214 |
| | **RESISTORS** | |
| R8 | 1500 ohms ¼ w 5% | 112-966 |
| R9, 10 | 470 k ohms ¼ w 5% | 112-965 |

*Tuner assembly is a modified Standard Kollsman TX-PK-78.

## VIDEO IF AND AGC

| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| | **CAPACITORS** | |
| C301 | 22 pfd | 121-015 |
| C302, 323, 334, 335, 346 | .001 mfd | 123-115 |
| C303, 304, 305, 309, 310, 311, 316, 317, 318, 324, 325, 330, 332, 333, 340, 341, 342, 343, 344 | .001 mfd feed-thru | 129-200 |
| C306, 308 | HFT 65A | 821-141 |
| C307 | 100 pfd | 123-105 |
| C312, 345 | 3 pfd | 121-065 |
| C322 | 2.7 pfd | 121-040 |
| C326 | 1 pfd | 121-058 |
| C327 | 43 pfd | 121-023 |
| C328 | 43 pfd silver mica | 126-054 |
| C329 | 47 pfd silver mica | 126-068 |
| C331 | .5 mfd 200 wv | 125-022 |
| C336 | 20 pfd | 121-014 |
| C337, 338 | .0033 mfd | 124-026 |
| C339 | 2 mfd | 125-040 |
| C345 | .01 mfd | 124-031 |
| | **JACKS** | |
| J301, 302, 303, 304 | F-61A w/hdw | C821-155 |
| TP301, 302 | Tip Jack | 185-104 |
| | **RECTIFIERS** | |
| CR301, 302 | Solitron CER 70 | 137-712 |
| | **RESISTORS** | |
| R301 | 1600 ohm ½ w 5% | 112-389 |
| R302, 307, 312, 318 | 180 ohm ½ w 5% | 112-266 |
| R303, 313 | 100 ohm ½ w 5% | 112-233 |
| R304, 309, 314 | 10 ohm ½ w 5% | 112-107 |
| R305 | 15 k ohm ½ w 5% | 112-506 |
| R306 | 3900 ohm ½ w 5% | 112-434 |
| R308 | 91 ohm ½ w 5% | 112-230 |
| R310 | 2700 ohm ½ w 5% | 112-413 |
| R311 | 2200 ohm ½ w 5% | 112-401 |
| R315 | 330 ohm ½ w 5% | 112-296 |
| R316 | 1 k ohm pot | 118-039 |
| R317, 320 | 5600 ohm ½ w 5% | 112-455 |
| R319 | 1800 k ohm ½ w 10% | 112-773 |
| R321 | 100 k ohm ½ w 5% | 112-611 |
| R322 | 1 k ohm ½ w 5% | 112-359 |
| R323 | 680 ohm ½ w 5% | 112-338 |
| R324 | 10 k ohm ½ w 5% | 112-485 |
| R325 | 4700 ohm ½ w 5% | 112-443 |
| R326 | 82 ohm ½ w 5% | 112-224 |
| R327, 329, 333, 334 | 20 k ohm ½ w 5% | 112-524 |
| R328 | 82 k ohm ½ w 5% | 112-602 |
| R330 | 15 megohm ½ w 5% | 112-758 |
| R331 | 240 k ohm ½ w 5% | 112-662 |
| R332 | 470 k ohm ½ w 5% | 112-695 |

# REPLACEMENT PARTS LIST

| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| R337 | 4700 ohm 1 w 10% | 112-447 |
| R338 | 10 k ohm pot 2 w | 118-026 |
| R339 | 10 k ohm 1 w 10% | 112-489 |
| | **TRANSFORMERS** | |
| T301 | Transformer assembly | B815-138 |
| T302 | Transformer assembly | B815-140 |
| T303 | Transformer assembly w/cap. (3) | B815-137 |
| T304 | Transformer assembly w/cap. (3) | B815-142 |
| T305 | Transformer assembly | 144-066 |
| | **TUBES** | |
| V301, 302, 303 | 6CB6 | 131-313 |
| V304 | 6DC6 | 131-349 |
| V305 | 6AM8 | 131-304 |
| V306 | 6AU6 | 131-308 |
| V307 | 12AT7 | 131-400 |

## SOUND AND AFC

| | | |
|---|---|---|
| | **CAPACITORS** | |
| C201 | 100 pf | 126-013 |
| C202 | Teflon feed-thru | 129-226 |
| C206, 214, 215, 218, 220, 223, 225, 226, 227, 228, 231 | .001 mfd feed-thru | 129-200 |
| C207, 209 | .01 mfd cer. disc | 124-031 |
| C208 | 100 pfd cer. disc | 124-101 |
| C210 | 2.7 pfd NPO ceramic | 121-040 |
| C211, 212, 213, 216, 222, 229, 230 | .001 mfd cer. disc | 123-115 |
| C217, 224 | 1 pfd NPO ceramic | 121-058 |
| C221 | 1.5 —10 Trimmer w/screw | 128-510 |
| | **CRYSTAL** | |
| Y201 | 36.777 mc ± .005% | 139-146 |
| | **DIODES** | |
| CR201, 202 | IN542 (matched pair) | 139-167 |
| | **JACKS** | |
| J201, 202 | Phono | 185-116 |
| J203, 204 | F-61A w/hdw | C821-155 |
| | **RESISTORS** | |
| R201, 202 | 47 k ohm | 112-569 |
| R205, 209, 211 | 10 k ohm ½ w 5% | 112-485 |
| R206 | 15 k ohm 1 w 10% | 112-510 |
| R207, 208 | 47 k ohm ½ w 5% | 112-569 |
| R210 | 220 k ohm ½ w 5% | 112-653 |
| R212 | 56 ohm ½ w 5% | 112-203 |
| R213, 214 | 100 ohm ½ w 5% | 112-233 |
| R215 | 1 megohm ½ w 5% | 112-737 |
| R216 | 180 ohm ½ w 5% | 112-266 |
| R217, 219 | 100 k ohm ½ w 5% | 112-611 |
| R218 | 5100 ohm ½ w 5% | 112-452 |
| R220 | 75 ohm ½ w 5% | 112-221 |
| R221 | 39 k ohm ½ w 5% | 112-560 |
| | **TRANSFORMERS** | |
| T201 | Transformer assembly (w/2 resistors 3 cap.) | B815-141 |
| T202 | Transformer assembly | B815-143 |
| T203 | Transformer assembly | B815-139 |
| T204 | Transformer assembly | B815-144 |
| | **TUBES** | |
| V201, 202 | 6BR8 | 131-356 |
| V203 | 6AU6 | 131-308 |
| V204, 205 | 6CB6 | 131-313 |

## SIGNAL REPLACER

| | | |
|---|---|---|
| | **CAPACITORS** | |
| C401, 402, 404 | .001 mfd ceramic disc | 123-115 |
| C403 | 1.8 pfd TCZ ceramic | 121-039 |
| C405 | 2 mfd 200 wv | 125-009 |
| | **CRYSTAL** | |
| Y401 | 45.750 mc ± .005% | 139-125 |
| | **JACKS** | |
| J401, 402 | F-61A w/hdwr | C821-155 |
| | **RESISTORS** | |
| R401 | 47 k ohm ½ w 5% | 112-569 |
| R402 | 6800 ohm 1w 5% | 112-464 |
| R403 | 50 k ohm pot | 118-024 |
| R404, 405 | 2200 ohm ½ w 5% | 112-401 |
| R406 | 100 k ohm ½ w 5% | 112-611 |
| R407 | 300 k ohm ½ w 5% | 112-671 |
| R408 | 4.7 megohm ½ w 5% | 112-821 |
| R409 | 100 k ohm pot | 118-022 |
| | **SWITCH** | |
| RY401 | Mercury relay | 160-100 |
| | **TUBE** | |
| V401 | 6DJ8 | 131-329 |

## CONVERTERS MODELS CCV-*

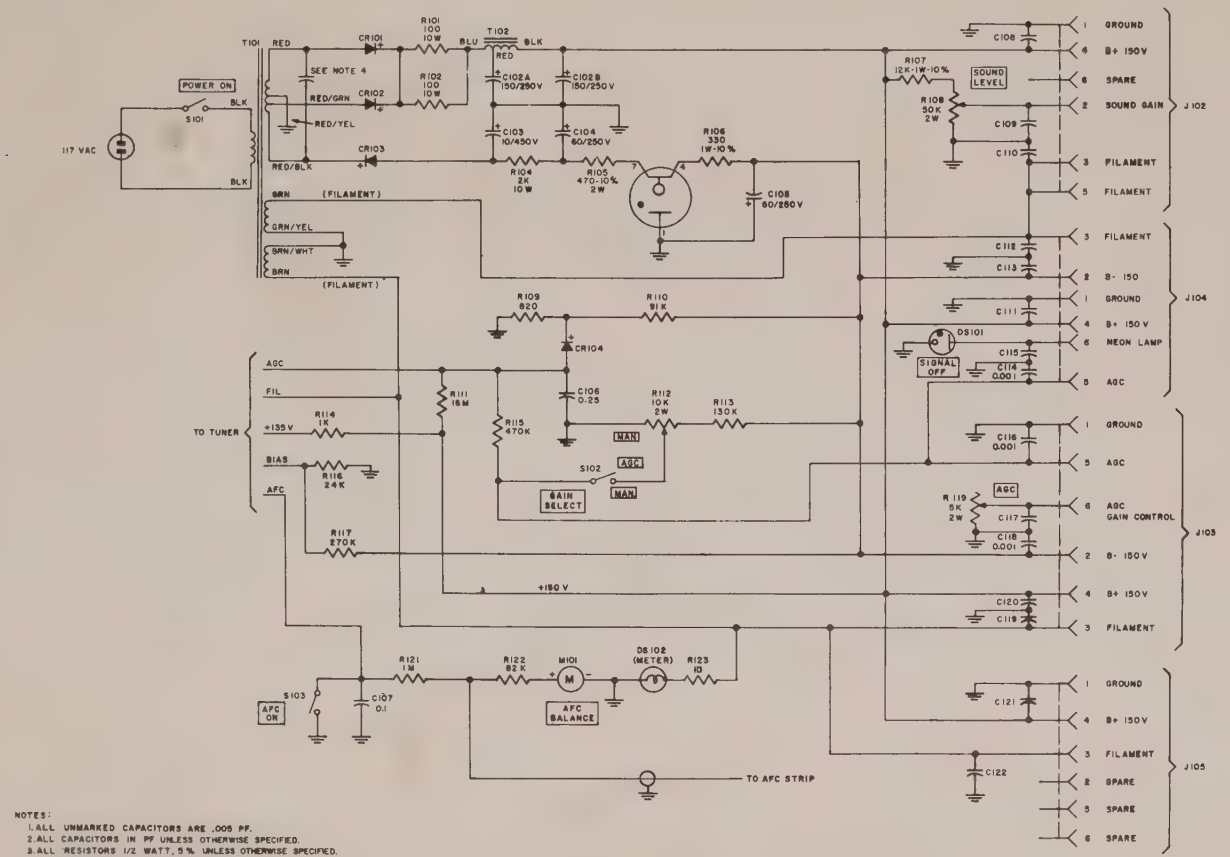
### PARTS COMMON TO ALL MODELS

| | | |
|---|---|---|
| | **CAPACITORS** | |
| C501 | 1.5 pfd TCZ | 121-004 |
| C502 | 15 pfd TCZ | 121-013 |
| C504, 507, 513, 520, 527, 528, 529, 530, 533 | 1000 pfd | 123-115 |
| C508, 509, 512, 514, 517, 518, 519, 523, 524, 525 | 1000 pfd feed-thru | 129-200 |
| C510 | 2.2 pfd TCZ | 121-005 |
| C511 | 56 pfd TCZ | 121-027 |
| C516 | 4.7 pfd TCZ | 121-007 |
| C521, 522 | 8—50 pfd trimmer | 128-501 |
| | **JACKS** | |
| J501, 502, 504, 505, 506 | F-61A w/hdwr | C821-155 |
| | **PLUG** | |
| P501 | Electrical | 184-004 |
| | **PLUG-IN PAD** | |
| MODEL PIP | Model PIP-* (*=value necessary) | None |
| | **RESISTORS** | |
| R501 | 47 k ohm ½ w 10% | 112-572 |
| R502 | 4.7 k ohm 1 w 10% | 112-447 |
| R503 | 510 ohm ½ w 5% | 112-326 |
| R504 | 470 k ohm ½ w 10% | 112-698 |
| R505 | 180 ohm ½ w 10% | 112-269 |
| R506 | 22 k ohm ½ w 10% | 112-530 |
| R507 | 820 ohm ½ w 5% | 112-350 |
| R508 | 220 k ohm ½ w 20% | 112-659 |
| R509 | 27 k ohm ½ w 10% | 112-542 |
| R510 | 10 k ohm ½ w 5% | 112-485 |
| R511, 512 | 100 ohm ½ w 10% | 112-236 |

# REPLACEMENT PARTS LIST

| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| R513 | 2.2 k ohm ½ w 10% | 112-404 |
| R514 | 1.5 k ohm ½ w 10% | 112-383 |
| R515 | 75 ohm ½ w 5% | 112-221 |
| R519 | 10 ohm ½ w 10% | 112-110 |
| | **SWITCH** | |
| S501 | dpdt slide | 162-003 |
| | **SOCKET** | |
| J503 | Cinch 2675 | 182-103 |
| | **TRANSFORMER** | |
| T501 | Transformer Assembly | C144-067 |
| | **TUBES** | |
| V501, 502 | 5654 | 131-500 |
| V503 | 6CY5 | 131-316 |
| V504 | 12BY7A | 131-403 |
| | **PARTS COMMON TO CCV-2 thru 6** | |
| | **CAPACITORS** | |
| C506, 534 | 8—50 pfd trimmer | 128-501 |
| C515 | 0.47 pfd 10% QC | 122-002 |
| C532 | 82 pfd TCZ | 121-031 |
| | **RESISTORS** | |
| R517, 518 | 470 ohm ½ w 5% | 112-317 |
| | **PARTS COMMON TO CCV-7 thru 13** | |
| | **CAPACITORS** | |
| C503 | 1.5—7 pfd NPO | 128-500 |
| C506 | 3—12 pfd NPO | 128-520 |
| C515 | 0.43 pfd ± 10% cer. gim. | 122-001 |
| C534 | 1.8 pfd ± .25 pfd NPO cer. tub. | 121-039 |
| | **CCV-2 ONLY** | |
| | **CAPACITORS** | |
| C503 | 1.5 pfd TCZ | 121-004 |
| C531 | 82 pfd TCZ | 121-031 |
| | **CRYSTAL** | |
| Y501 | 101 mc ± .005% | 139-151 |
| | **RESISTOR** | |
| R516 | 20 k ohm ½ w 5% | 112-524 |
| | **CCV-3 ONLY** | |
| | **CAPACITORS** | |
| C503 | 1.5 pfd TCZ | 121-004 |
| C531 | 82 pfd TCZ | 121-031 |
| | **CRYSTAL** | |
| Y501 | 107 mc ± .005% | 139-152 |
| | **RESISTOR** | |
| R516 | 16 k ohm ½ w 5% | 112-515 |
| | **CCV-4 ONLY** | |
| | **CAPACITORS** | |
| C503 | 1.5 pfd TCZ | 121-004 |
| C531 | 82 pfd TCZ | 121-031 |

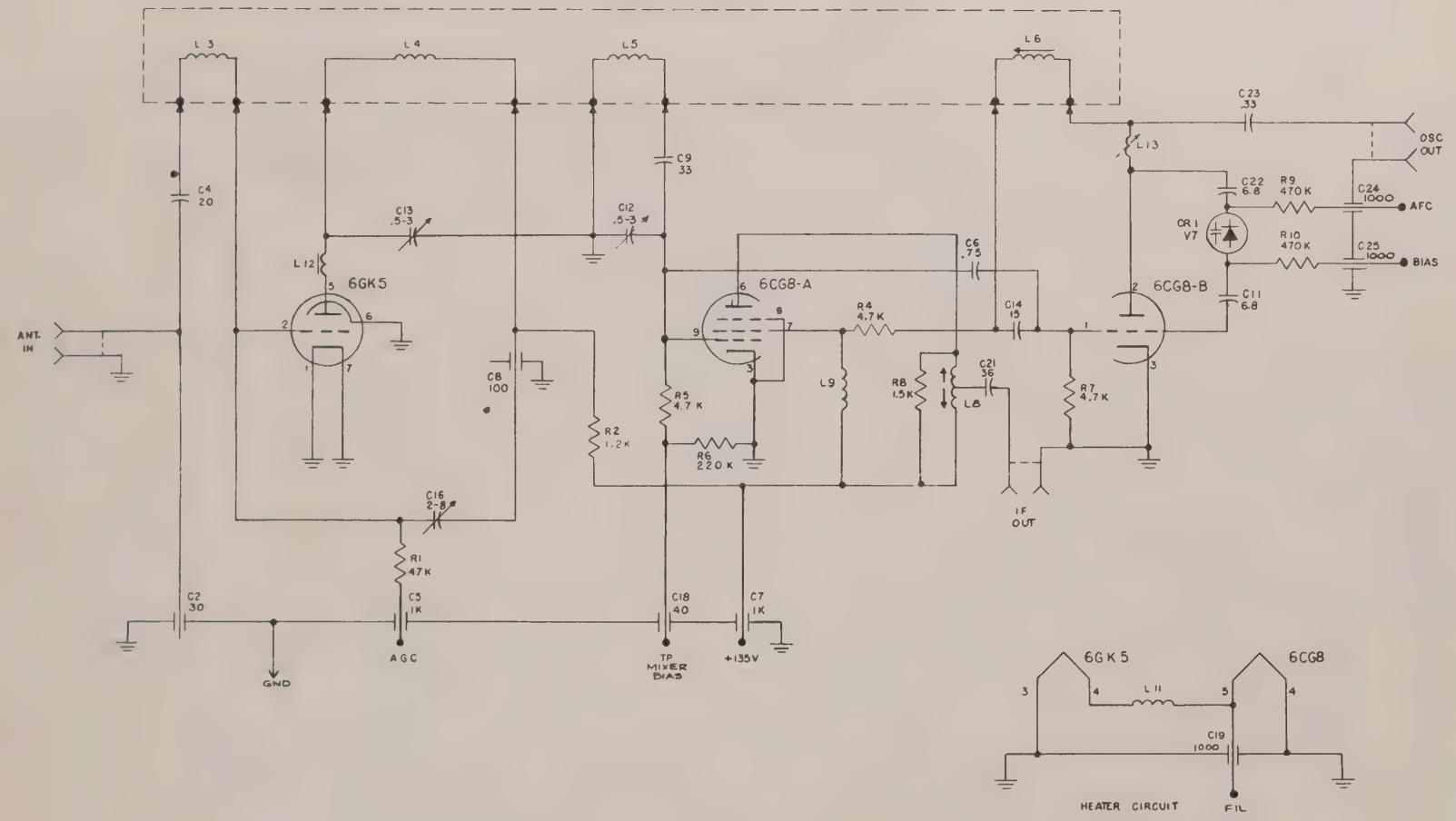
| SCHEM. DES. | DESCRIPTION | JERROLD PART NO. |
|---|---|---|
| | **CRYSTAL** | |
| Y501 | 113 mc ± .005% | 139-153 |
| | **RESISTOR** | |
| R516 | 10 k ohm ½ w 5% | 112-485 |
| | **CCV-5 ONLY** | |
| | **CAPACITORS** | |
| C503 | 1.0 pfd TCZ | 121-003 |
| C531 | 47 pfd TCZ | 121-024 |
| | **CRYSTAL** | |
| Y501 | 123 mc ± .005% | 139-154 |
| | **RESISTOR** | |
| R516 | 10 k ohm ½ w 5% | 112-485 |
| | **CCV-6 ONLY** | |
| | **CAPACITORS** | |
| C503 | 1.0 pfd TCZ | 121-003 |
| C531 | 22 pfd TCZ | 121-015 |
| | **CRYSTAL** | |
| Y501 | 129 mc ± .005% | 139-155 |
| | **RESISTOR** | |
| R516 | 7.5 k ohm ½ w 5% | 112-473 |
| | **CCV-7 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 110.5 mc ± .005% | 139-156 |
| | **CCV-8 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 113.5 mc ± .005% | 139-157 |
| | **CCV-9 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 116.5 mc ± .005% | 139-158 |
| | **CCV-10 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 119.5 mc ± .005% | 139-159 |
| | **CCV-11 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 122.5 mc ± .005% | 139-160 |
| | **CCV-12—ONLY** | |
| | **CRYSTAL** | |
| Y501 | 125.5 mc ± .005% | 139-161 |
| | **CCV-13 ONLY** | |
| | **CRYSTAL** | |
| Y501 | 128.5 mc ± .005% | 139-162 |




NOTES:
1. ALL UNMARKED CAPACITORS ARE .005 PF.
2. ALL CAPACITORS IN PF UNLESS OTHERWISE SPECIFIED.
3. ALL RESISTORS 1/2 WATT, 5% UNLESS OTHERWISE SPECIFIED.
4. CAPACITOR SUPPLIED BY T101 TRANS. MFG.

Fig. 11—Power Supply Schematic

E861-475-A




NOTE :
1. ALL CAPACITOR VALUES ARE IN PF UNLESS NOTED OTHERWISE.

**Fig. 12—Tuner Schematic**

DBGI-479

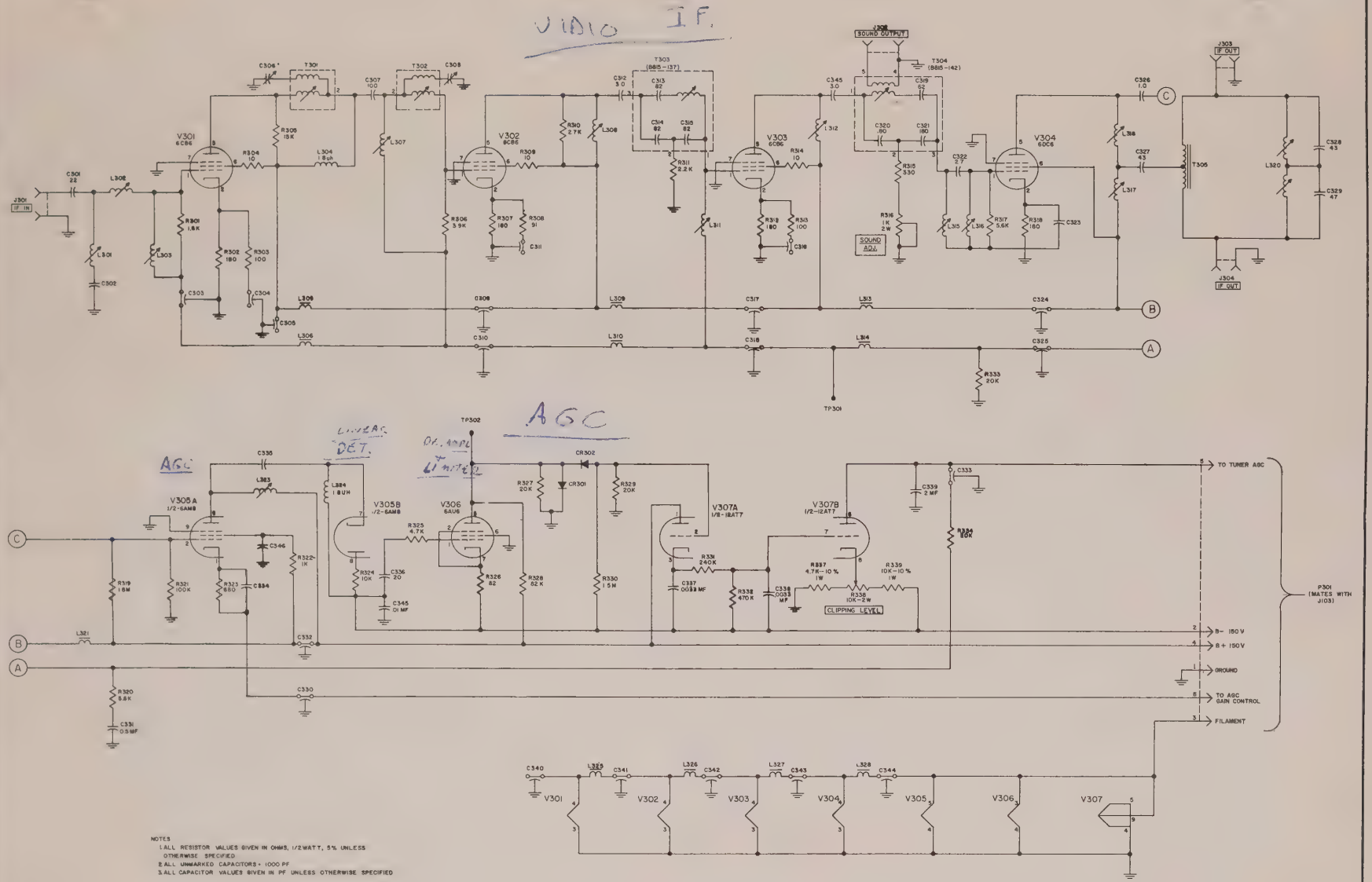
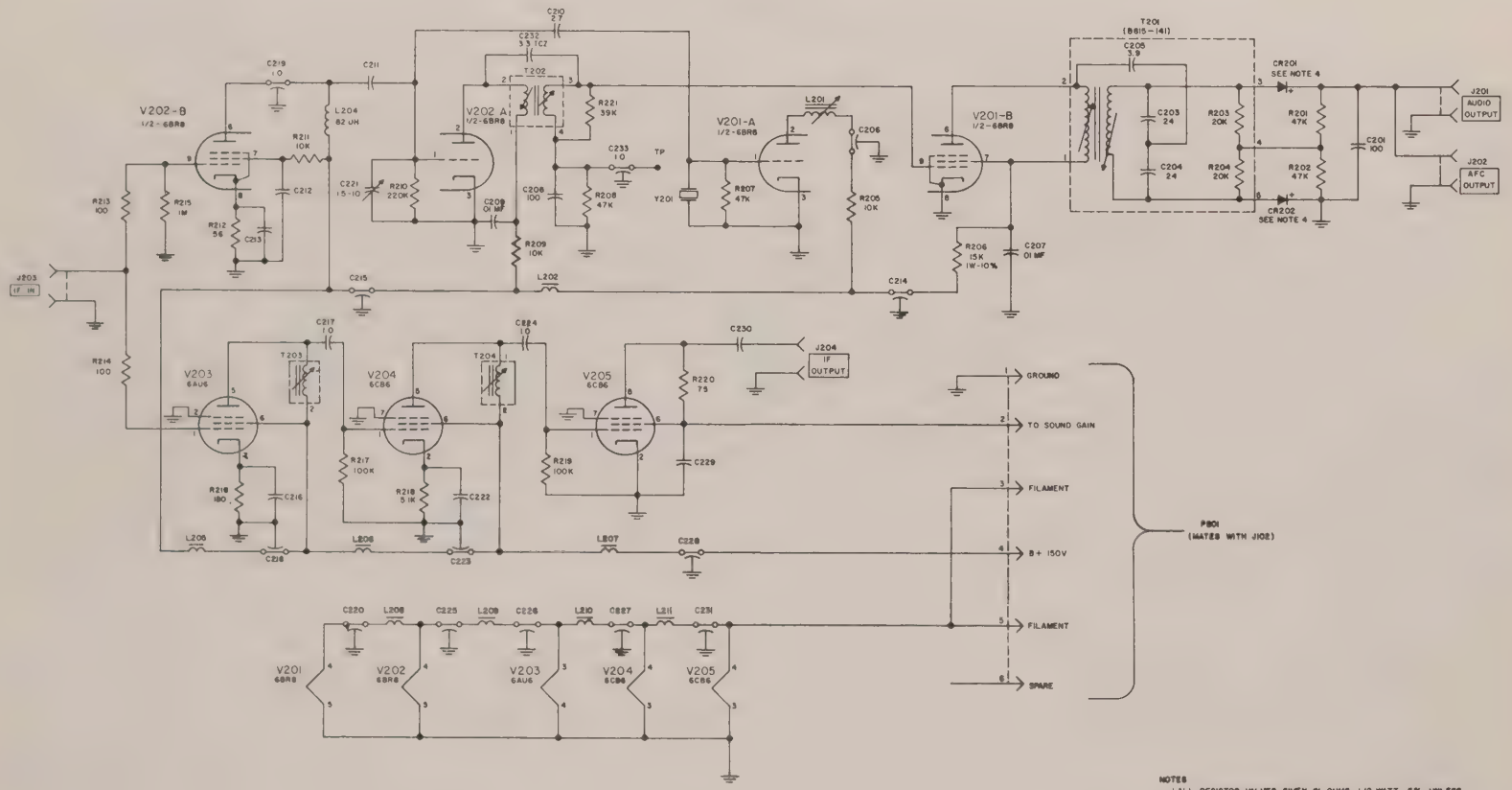



Fig. 13—Video IF and AGC Schematic




NOTES
1. ALL RESISTOR VALUES GIVEN IN OHMS, 1/2 WATT, 5% UNLESS OTHERWISE SPECIFIED
2. ALL UNMARKED CAPACITORS = 1000PF
3. ALL CAPACITOR VALUES GIVEN IN PF UNLESS OTHERWISE SPECIFIED
4. CR201 & CR202 ARE A MATCHED PAIR OF IN541

E861-477-C

**Fig. 14—Sound and AFC Schematic**

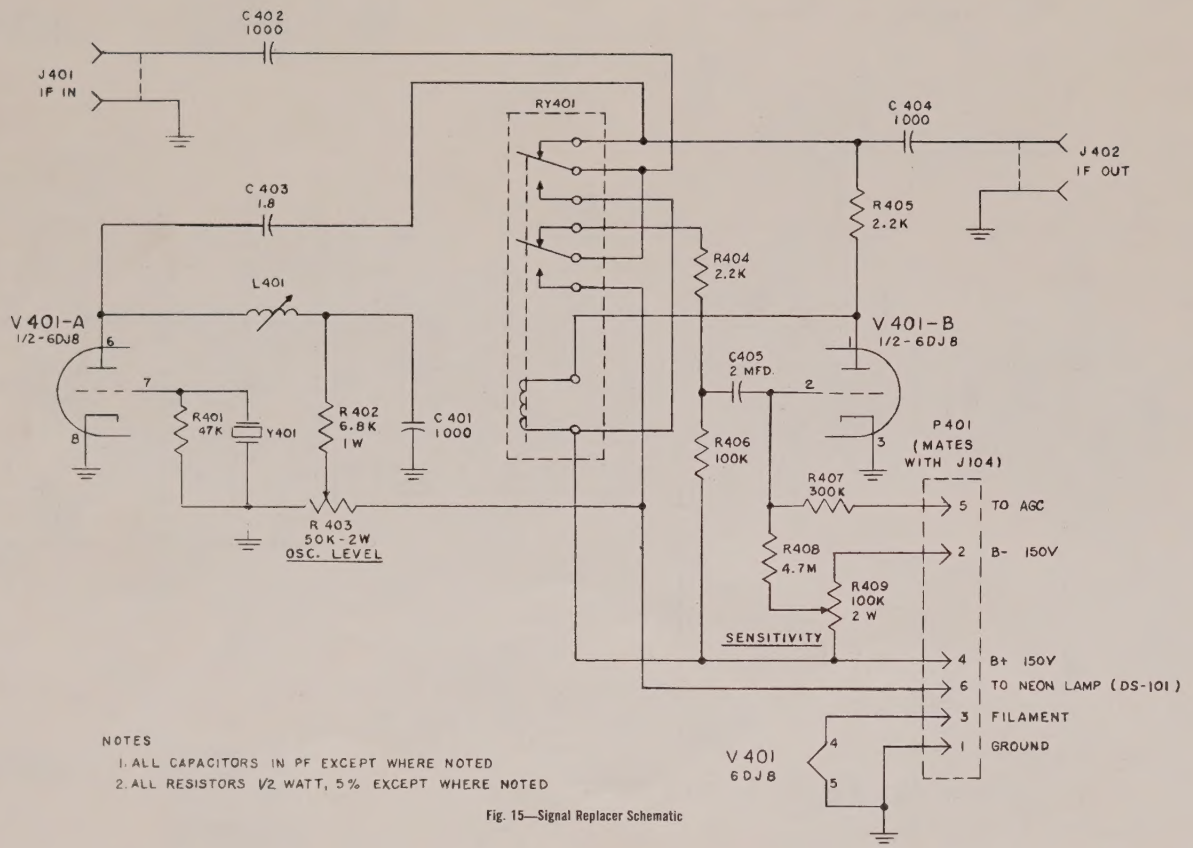
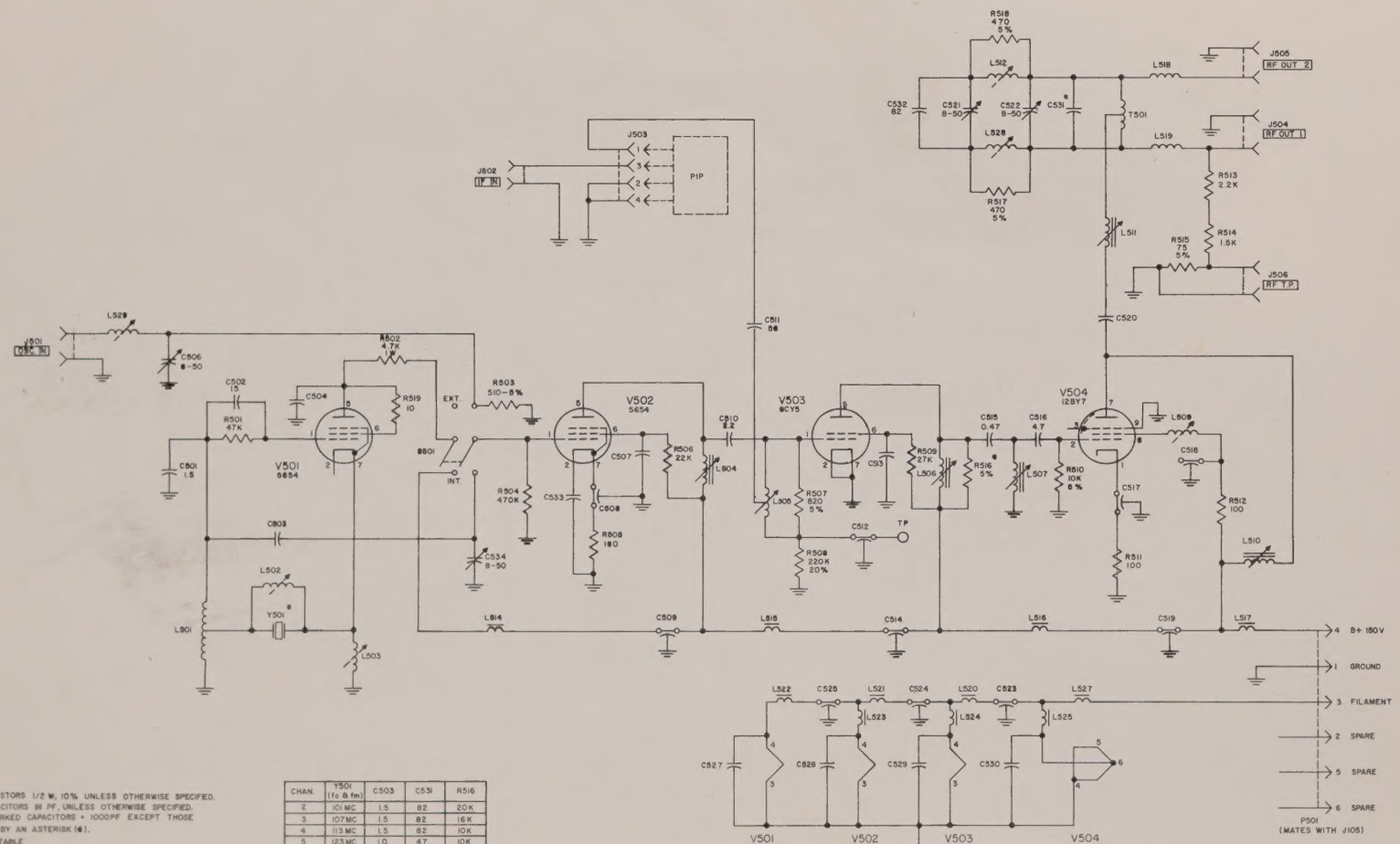



Fig. 15—Signal Replacer Schematic

Fig. 15—Signal Replacer Schematic

CONVERTER
MODEL CCV-2 TO CCV-6



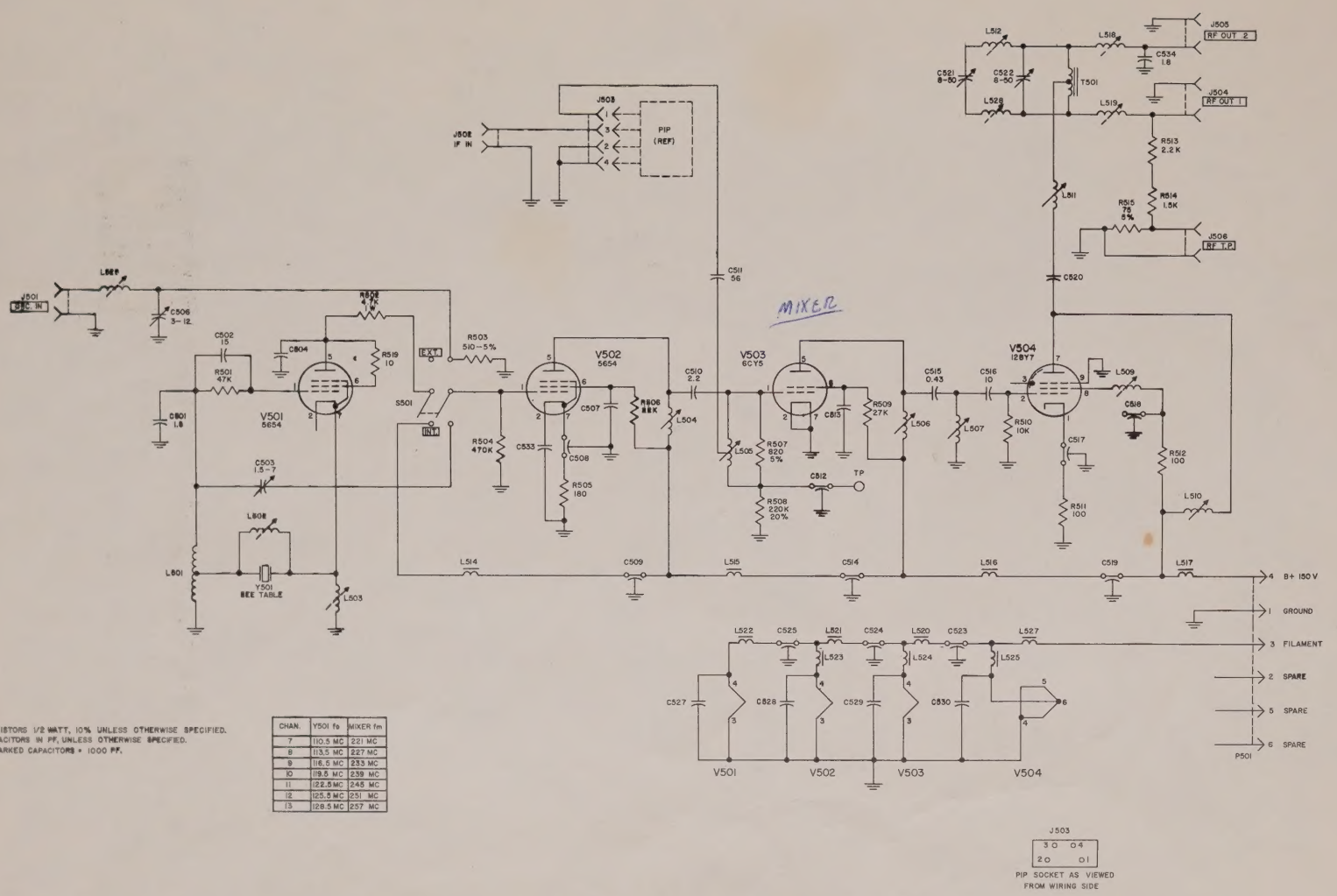

NOTES
1. ALL RESISTORS 1/2 W, 10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS IN PF, UNLESS OTHERWISE SPECIFIED.
3. ALL UNMARKED CAPACITORS = 1000PF EXCEPT THOSE DENOTED BY AN ASTERISK (*).
4. # = SEE TABLE

| CHAN. | Y501 (fo & fm) | C503 | C531 | R516 |
|---|---|---|---|---|
| 2 | 101 MC | 1.5 | 82 | 20K |
| 3 | 107 MC | 1.5 | 82 | 16K |
| 4 | 113 MC | 1.5 | 82 | 10K |
| 5 | 123 MC | 1.0 | 47 | 10K |
| 6 | 129 MC | 1.0 | 22 | 7.5K |

J503
3 O O 4
2 O O 1
PIP SOCKET AS VIEWED FROM WIRING SIDE

Fig. 16—Model CCV (Low Channels) Schematic

CONVERTER
MODELS CCV-7 TO CCV-13
COM



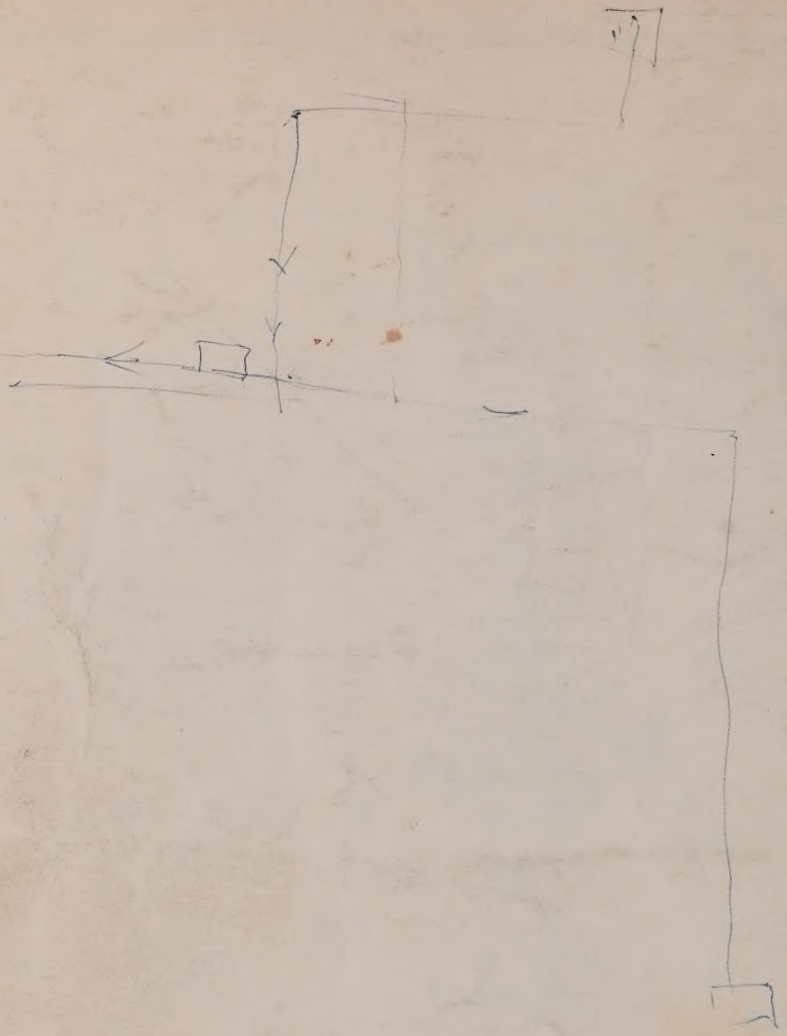

NOTES
1. ALL RESISTORS 1/2 WATT, 10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS IN PF, UNLESS OTHERWISE SPECIFIED.
3. ALL UNMARKED CAPACITORS = 1000 PF.

| CHAN. | Y501 fo | MIXER fm |
|---|---|---|
| 7 | 110.5 MC | 221 MC |
| 8 | 113.5 MC | 227 MC |
| 9 | 116.5 MC | 233 MC |
| 10 | 119.5 MC | 239 MC |
| 11 | 122.5 MC | 245 MC |
| 12 | 125.5 MC | 251 MC |
| 13 | 128.5 MC | 257 MC |

Fig. 17—Model CCV (High Channels) Schematic



E861-510-A



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